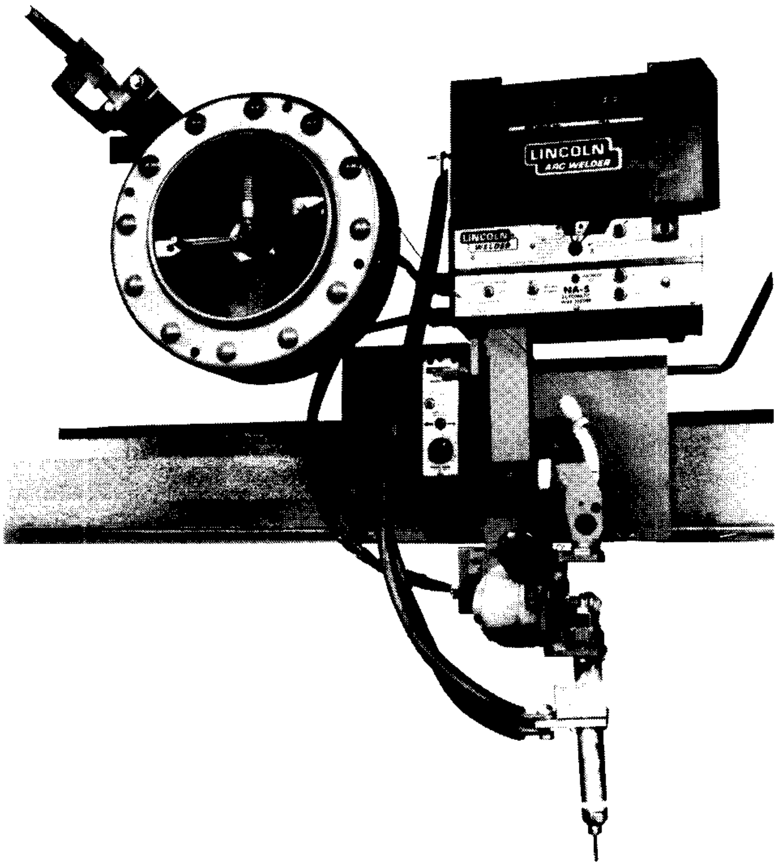
RETURN TO MAIN MENU

IM305-C

NA-5 AUTOMATIC WELDING SYSTEM

September, 2010

For use with Models NA-5N
NA-5NF
NA-5S
NA-5SF



Safety Depends on You

Lincoln arc welding and cutting equipment is designed and built with safety in mind. However, your overall safety can be increased by proper installation ... and thoughtful operation on your part. **DO NOT INSTALL OPERATE OR REPAIR THIS EQUIPMENT WITHOUT READING THIS MANUAL AND THE SAFETY PRECAUTIONS CONTAINED THROUGHOUT.** And, most importantly, think before you act and be careful.

Damage Claims

When this equipment is shipped, title passes to the purchaser upon receipt by the carrier. Consequently, claims for material damaged in shipment must be made by the purchaser against the transportation company at the time the shipment is received.

OPERATOR'S MANUAL

ISO 9001
Designed and Manufactured Under a Quality Program Certified by ABS Quality Evaluations, Inc. to ISO 9001 Requirements.
CERTIFICATE NUMBER: 30273

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LINCOLN® ELECTRIC

• World's Leader in Welding and Cutting Products •
• Sales and Service through Subsidiaries and Distributors Worldwide •
Cleveland, Ohio 44117-1199 U.S.A. TEL: 216.481.8100 FAX: 216.486.1751 WEB SITE: www.lincolnelectric.com

WARNING

CALIFORNIA PROPOSITION 65 WARNINGS

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

The Above For Diesel Engines

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

The Above For Gasoline Engines

ARC WELDING CAN BE HAZARDOUS. PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH. KEEP CHILDREN AWAY. PACEMAKER WEARERS SHOULD CONSULT WITH THEIR DOCTOR BEFORE OPERATING.

Read and understand the following safety highlights. For additional safety information, it is strongly recommended that you purchase a copy of “Safety in Welding & Cutting - ANSI Standard Z49.1” from the American Welding Society, P.O. Box 351040, Miami, Florida 33135 or CSA Standard W117.2-1974. A Free copy of “Arc Welding Safety” booklet E205 is available from the Lincoln Electric Company, 22801 St. Clair Avenue, Cleveland, Ohio 44117-1199.

BE SURE THAT ALL INSTALLATION, OPERATION, MAINTENANCE AND REPAIR PROCEDURES ARE PERFORMED ONLY BY QUALIFIED INDIVIDUALS.

FOR ENGINE powered equipment.

1.a. Turn the engine off before troubleshooting and maintenance work unless the maintenance work requires it to be running.



1.b. Operate engines in open, well-ventilated areas or vent the engine exhaust fumes outdoors.



1.c. Do not add the fuel near an open flame welding arc or when the engine is running. Stop the engine and allow it to cool before refueling to prevent spilled fuel from vaporizing on contact with hot engine parts and igniting. Do not spill fuel when filling tank. If fuel is spilled, wipe it up and do not start engine until fumes have been eliminated.

1.d. Keep all equipment safety guards, covers and devices in position and in good repair.Keep hands, hair, clothing and tools away from V-belts, gears, fans and all other moving parts when starting, operating or repairing equipment.

1.e. In some cases it may be necessary to remove safety guards to perform required maintenance. Remove guards only when necessary and replace them when the maintenance requiring their removal is complete. Always use the greatest care when working near moving parts.

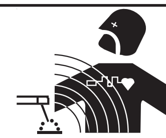


1.f. Do not put your hands near the engine fan. Do not attempt to override the governor or idler by pushing on the throttle control rods while the engine is running.

1.g. To prevent accidentally starting gasoline engines while turning the engine or welding generator during maintenance work, disconnect the spark plug wires, distributor cap or magneto wire as appropriate.



1.h. To avoid scalding, do not remove the radiator pressure cap when the engine is hot.



ELECTRIC AND MAGNETIC FIELDS may be dangerous

2.a. Electric current flowing through any conductor causes localized Electric and Magnetic Fields (EMF). Welding current creates EMF fields around welding cables and welding machines

2.b. EMF fields may interfere with some pacemakers, and welders having a pacemaker should consult their physician before welding.

2.c. Exposure to EMF fields in welding may have other health effects which are now not known.

2.d. All welders should use the following procedures in order to minimize exposure to EMF fields from the welding circuit:

2.d.1. Route the electrode and work cables together - Secure them with tape when possible.

2.d.2. Never coil the electrode lead around your body.

2.d.3. Do not place your body between the electrode and work cables. If the electrode cable is on your right side, the work cable should also be on your right side.

2.d.4. Connect the work cable to the workpiece as close as possible to the area being welded.

2.d.5. Do not work next to welding power source.

Mar ‘95



ELECTRIC SHOCK can kill.

3.a. The electrode and work (or ground) circuits are electrically "hot" when the welder is on. Do not touch these "hot" parts with your bare skin or wet clothing. Wear dry, hole-free gloves to insulate hands.

3.b. Insulate yourself from work and ground using dry insulation. Make certain the insulation is large enough to cover your full area of physical contact with work and ground.

In addition to the normal safety precautions, if welding must be performed under electrically hazardous conditions (in damp locations or while wearing wet clothing; on metal structures such as floors, gratings or scaffolds; when in cramped positions such as sitting, kneeling or lying, if there is a high risk of unavoidable or accidental contact with the workpiece or ground) use the following equipment:

- **Semiautomatic DC Constant Voltage (Wire) Welder.**
- **DC Manual (Stick) Welder.**
- **AC Welder with Reduced Voltage Control.**

3.c. In semiautomatic or automatic wire welding, the electrode, electrode reel, welding head, nozzle or semiautomatic welding gun are also electrically "hot".

3.d. Always be sure the work cable makes a good electrical connection with the metal being welded. The connection should be as close as possible to the area being welded.

3.e. Ground the work or metal to be welded to a good electrical (earth) ground.

3.f. Maintain the electrode holder, work clamp, welding cable and welding machine in good, safe operating condition. Replace damaged insulation.

3.g. Never dip the electrode in water for cooling.

3.h. Never simultaneously touch electrically "hot" parts of electrode holders connected to two welders because voltage between the two can be the total of the open circuit voltage of both welders.

3.i. When working above floor level, use a safety belt to protect yourself from a fall should you get a shock.

3.j. Also see Items 6.c. and 8.



ARC RAYS can burn.

4.a. Use a shield with the proper filter and cover plates to protect your eyes from sparks and the rays of the arc when welding or observing open arc welding. Headshield and filter lens should conform to ANSI Z87. I standards.

4.b. Use suitable clothing made from durable flame-resistant material to protect your skin and that of your helpers from the arc rays.

4.c. Protect other nearby personnel with suitable, non-flammable screening and/or warn them not to watch the arc nor expose themselves to the arc rays or to hot spatter or metal.



FUMES AND GASES can be dangerous.

5.a. Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. When welding, keep your head out of the fume. Use enough ventilation and/or exhaust at the arc to keep fumes and gases away from the breathing zone. **When welding with electrodes which require special ventilation such as stainless or hard facing (see instructions on container or MSDS) or on lead or cadmium plated steel and other metals or coatings which produce highly toxic fumes, keep exposure as low as possible and within applicable OSHA PEL and ACGIH TLV limits using local exhaust or mechanical ventilation. In confined spaces or in some circumstances, outdoors, a respirator may be required. Additional precautions are also required when welding on galvanized steel.**

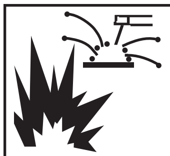
5. b. The operation of welding fume control equipment is affected by various factors including proper use and positioning of the equipment, maintenance of the equipment and the specific welding procedure and application involved. Worker exposure level should be checked upon installation and periodically thereafter to be certain it is within applicable OSHA PEL and ACGIH TLV limits.

5.c. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.

5.d. Shielding gases used for arc welding can displace air and cause injury or death. Always use enough ventilation, especially in confined areas, to insure breathing air is safe.

5.e. Read and understand the manufacturer's instructions for this equipment and the consumables to be used, including the material safety data sheet (MSDS) and follow your employer's safety practices. MSDS forms are available from your welding distributor or from the manufacturer.

5.f. Also see item 1.b.



WELDING and CUTTING SPARKS can cause fire or explosion.

6.a. Remove fire hazards from the welding area. If this is not possible, cover them to prevent the welding sparks from starting a fire. Remember that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas. Avoid welding near hydraulic lines. Have a fire extinguisher readily available.

6.b. Where compressed gases are to be used at the job site, special precautions should be used to prevent hazardous situations. Refer to “Safety in Welding and Cutting” (ANSI Standard Z49.1) and the operating information for the equipment being used.

6.c. When not welding, make certain no part of the electrode circuit is touching the work or ground. Accidental contact can cause overheating and create a fire hazard.

6.d. Do not heat, cut or weld tanks, drums or containers until the proper steps have been taken to insure that such procedures will not cause flammable or toxic vapors from substances inside. They can cause an explosion even though they have been “cleaned”. For information, purchase “Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances”, AWS F4.1 from the American Welding Society (see address above).

6.e. Vent hollow castings or containers before heating, cutting or welding. They may explode.

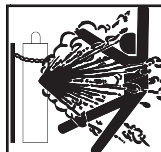
6.f. Sparks and spatter are thrown from the welding arc. Wear oil free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes and a cap over your hair. Wear ear plugs when welding out of position or in confined places. Always wear safety glasses with side shields when in a welding area.

6.g. Connect the work cable to the work as close to the welding area as practical. Work cables connected to the building framework or other locations away from the welding area increase the possibility of the welding current passing through lifting chains, crane cables or other alternate circuits. This can create fire hazards or overheat lifting chains or cables until they fail.

6.h. Also see item 1.c.

6.I. Read and follow NFPA 51B “ Standard for Fire Prevention During Welding, Cutting and Other Hot Work”, available from NFPA, 1 Batterymarch Park, PO box 9101, Quincy, Ma 022690-9101.

6.j. Do not use a welding power source for pipe thawing.



CYLINDER may explode if damaged.

7.a. Use only compressed gas cylinders containing the correct shielding gas for the process used and properly operating regulators designed for the gas and pressure used. All hoses, fittings, etc. should be suitable for the application and maintained in good condition.

7.b. Always keep cylinders in an upright position securely chained to an undercarriage or fixed support.

7.c. Cylinders should be located:
- Away from areas where they may be struck or subjected to physical damage.
- A safe distance from arc welding or cutting operations and any other source of heat, sparks, or flame.

7.d. Never allow the electrode, electrode holder or any other electrically “hot” parts to touch a cylinder.

7.e. Keep your head and face away from the cylinder valve outlet when opening the cylinder valve.

7.f. Valve protection caps should always be in place and hand tight except when the cylinder is in use or connected for use.

7.g. Read and follow the instructions on compressed gas cylinders, associated equipment, and CGA publication P-l, “Precautions for Safe Handling of Compressed Gases in Cylinders,” available from the Compressed Gas Association 1235 Jefferson Davis Highway, Arlington, VA 22202.



FOR ELECTRICALLY powered equipment.

8.a. Turn off input power using the disconnect switch at the fuse box before working on the equipment.

8.b. Install equipment in accordance with the U.S. National Electrical Code, all local codes and the manufacturer’s recommendations.

8.c. Ground the equipment in accordance with the U.S. National Electrical Code and the manufacturer’s recommendations.

Refer to **http://www.lincolnelectric.com/safety** for additional safety information.

PRÉCAUTIONS DE SÛRETÉ

Pour votre propre protection lire et observer toutes les instructions et les précautions de sûreté specifiques qui parraissent dans ce manuel aussi bien que les précautions de sûreté générales suivantes:

Sûreté Pour Soudage A L'Arc

1. Protegez-vous contre la secousse électrique:

   a. Les circuits à l'électrode et à la piéce sont sous tension quand la machine à souder est en marche. Eviter toujours tout contact entre les parties sous tension et la peau nue ou les vétements mouillés. Porter des gants secs et sans trous pour isoler les mains.
   b. Faire trés attention de bien s'isoler de la masse quand on soude dans des endroits humides, ou sur un plancher metallique ou des grilles metalliques, principalement dans les positions assis ou couché pour lesquelles une grande partie du corps peut être en contact avec la masse.
   c. Maintenir le porte-électrode, la pince de masse, le câble de soudage et la machine à souder en bon et sûr état defonctionnement.
   d. Ne jamais plonger le porte-électrode dans l'eau pour le refroidir.
   e. Ne jamais toucher simultanément les parties sous tension des porte-électrodes connectés à deux machines à souder parce que la tension entre les deux pinces peut être le total de la tension à vide des deux machines.
   f. Si on utilise la machine à souder comme une source de courant pour soudage semi-automatique, ces precautions pour le porte-électrode s'applicuent aussi au pistolet de soudage.

2. Dans le cas de travail au dessus du niveau du sol, se protéger contre les chutes dans le cas ou on recoit un choc. Ne jamais enrouler le câble-électrode autour de n'importe quelle partie du corps.

3. Un coup d'arc peut être plus sévère qu'un coup de soliel, donc:

   a. Utiliser un bon masque avec un verre filtrant approprié ainsi qu'un verre blanc afin de se protéger les yeux du rayonnement de l'arc et des projections quand on soude ou quand on regarde l'arc.
   b. Porter des vêtements convenables afin de protéger la peau de soudeur et des aides contre le rayonnement de l'arc.
   c. Protéger l'autre personnel travaillant à proximité au soudage à l'aide d'écrans appropriés et non-inflammables.

4. Des gouttes de laitier en fusion sont émises de l'arc de soudage. Se protéger avec des vêtements de protection libres de l'huile, tels que les gants en cuir, chemise épaisse, pantalons sans revers, et chaussures montantes.

5. Toujours porter des lunettes de sécurité dans la zone de soudage. Utiliser des lunettes avec écrans lateraux dans les zones où l'on pique le laitier.

6. Eloigner les matériaux inflammables ou les recouvrir afin de prévenir tout risque d'incendie dû aux étincelles.

7. Quand on ne soude pas, poser la pince à une endroit isolé de la masse. Un court-circuit accidental peut provoquer un échauffement et un risque d'incendie.

8. S'assurer que la masse est connectée le plus prés possible de la zone de travail qu'il est pratique de le faire. Si on place la masse sur la charpente de la construction ou d'autres endroits éloignés de la zone de travail, on augmente le risque de voir passer le courant de soudage par les chaines de levage, câbles de grue, ou autres circuits. Cela peut provoquer des risques d'incendie ou d'echauffement des chaines et des câbles jusqu'à ce qu'ils se rompent.

9. Assurer une ventilation suffisante dans la zone de soudage. Ceci est particuliérement important pour le soudage de tôles galvanisées plombées, ou cadmiées ou tout autre métal qui produit des fumeés toxiques.

10. Ne pas souder en présence de vapeurs de chlore provenant d'opérations de dégraissage, nettoyage ou pistolage. La chaleur ou les rayons de l'arc peuvent réagir avec les vapeurs du solvant pour produire du phosgéne (gas fortement toxique) ou autres produits irritants.

11. Pour obtenir de plus amples renseignements sur la sûreté, voir le code "Code for safety in welding and cutting" CSA Standard W 117.2-1974.

PRÉCAUTIONS DE SÛRETÉ POUR LES MACHINES À SOUDER À TRANSFORMATEUR ET À REDRESSEUR

1. Relier à la terre le chassis du poste conformement au code de l'électricité et aux recommendations du fabricant. Le dispositif de montage ou la piece à souder doit être branché à une bonne mise à la terre.

2. Autant que possible, l'installation et l'entretien du poste seront effectués par un électricien qualifié.

3. Avant de faires des travaux à l'interieur de poste, la debrancher à l'interrupteur à la boite de fusibles.

4. Garder tous les couvercles et dispositifs de sûreté à leur place.

NOTES

PRODUCT DESCRIPTION

A new concept in automatic welding – a wire feeder which, when used with an appropriate Lincoln power source, takes the guesswork from procedure setting and procedure control. Designed to achieve higher quality control and weld quality levels more easily. The arc voltage and wire feed speed can be set on digital meters before the arc is struck and the procedure remains precisely set day in and day out on production jobs.

SEC. T1 – INDEX

Sec. T2 – Installation

Sec. T3 – Operating Instructions

The Lincoln Electric Company
Cleveland, Ohio 44117-1199

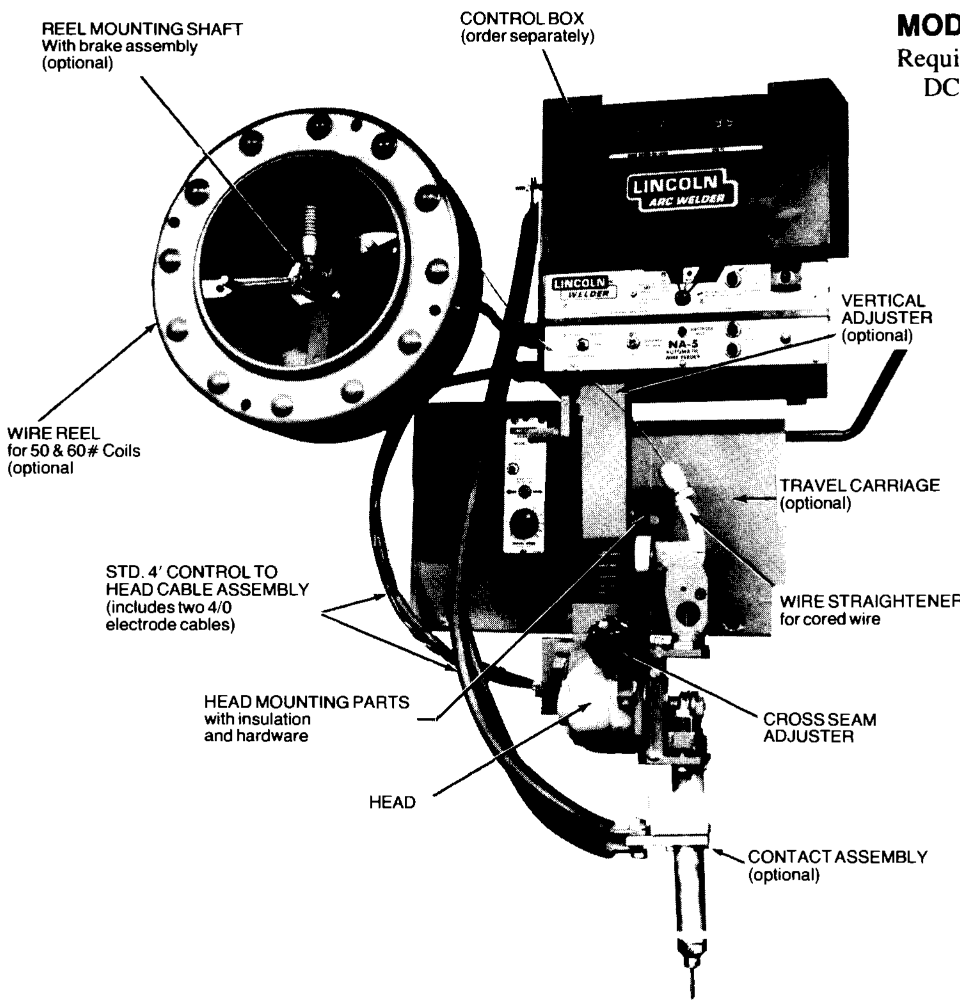
Sec. T6 – Maintenance

Sec. T7 – Parts Lists

SEC. T2.2 – MECHANICAL INSTALLATION

Sec. T2.2.1-N
Available Models

MODEL: NA-5N
Required Power Source:
DC Constant Voltage



MODEL: NA-5NF HEAD
(For Machinery and Fixture Builders)

NA-5 Control (order separately)

Required Power Source: DC Constant Voltage

Identical to the NA-5N except the following parts are not included:

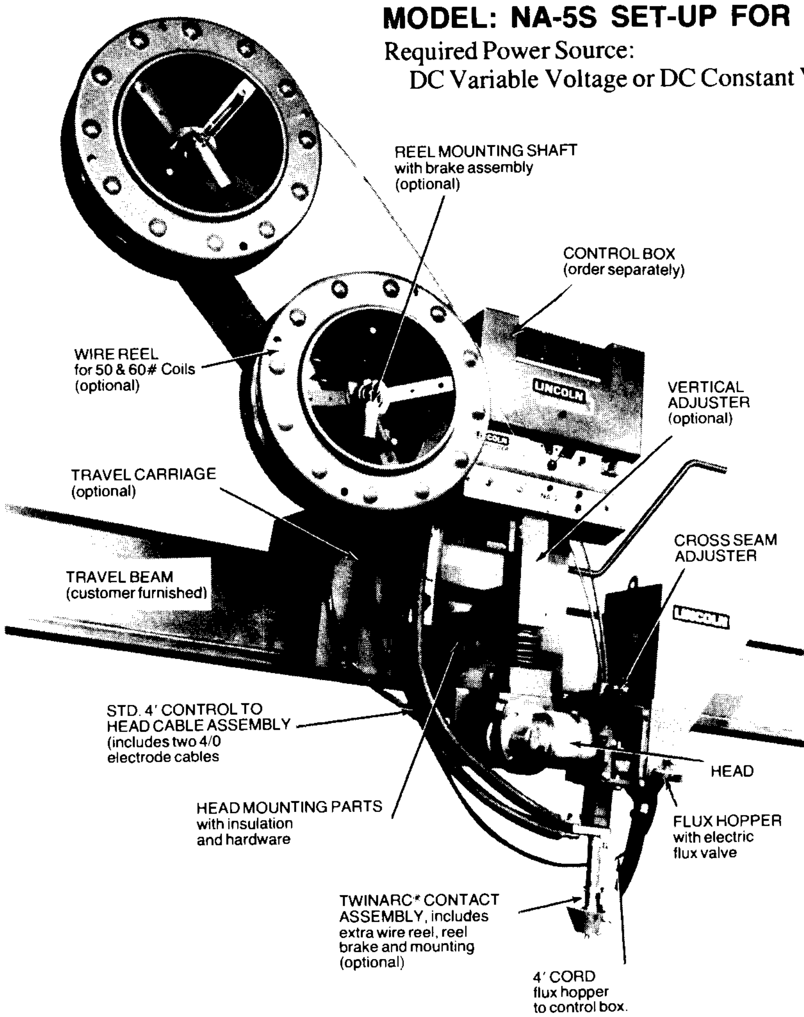
Head Mounting Parts
4' Electrode Cable
Cross Seam Adjuster

Sec. T2.2.1-S

Available Models

MODEL: NA-5S SET-UP FOR TWINARC®

Required Power Source:
DC Variable Voltage or DC Constant Voltage



MODEL: NA-5SF HEAD

(For Machinery and Fixture Builders)

NA-5 Control (order separately)

Required Power Source:
DC Constant Voltage

Identical to the NA-5S except the following parts are not included:

- Head Mounting Parts
- 4' Electrode Cable
- Cross Seam Adjuster
- Flux Hopper and Pointer Assembly

MECHANICAL INSTALLATION—CONT'D

Sec. T2.2.2
(File as Sec. L2.2.2 for IM-278)

Head Installation

A. GENERAL REQUIREMENTS (All Models)

Mountings and Fixtures — Design the installation with the adjustability required by the welding application. Include sufficient clearance for the head adjustments described in Sec. T3.2.3.

For best arc striking, use a rigid mounting which prevents the head from moving when the electrode strikes the work.

Insulation — The head and electrode are electrically "hot" when welding. They must be insulated from ground.

B. SPECIFIC REQUIREMENTS FOR NA-3N, NA-3S, NA-4 AND NA-5

Head mounting hardware and insulation is shipped with these heads. If installing an optional vertical lift adjuster or horizontal adjuster, see Sec. T2.2.11 or Sec. T2.2.12 respectively. To mount heads on the standard travel carriage, see Sec. T2.2.4. To mount heads on a separate fixture, provide the mounting holes specified in the dimension print.

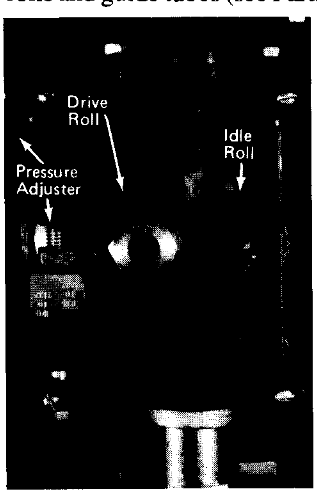
C. SPECIFIC REQUIREMENTS FOR THE NA-3NF AND NA-3SF, NA-5NF AND NA-5SF

These models do not include the head mounting parts and cannot be installed on the standard travel carriage. Design the head mounting and insulation parts to fit the fixture. Refer to appropriate dimension print.

D. WIRE FEED MECHANISM

All heads are shipped with the wire feed speed gear box ratio specified for the model ordered. To change the gear box ratio, see Sec. T6.2.2.

All heads are shipped ready to feed the wire sizes specified on the order. Feeding other sizes may require changing drive rolls and guide tubes (see Parts List P-100-D).



As Shipped

Adjust the idle roll pressure adjustment screw for the wire diameter to be used in production. As shown on the indicator, there are two settings — .035-3/32" and .120-7/32". Make this adjustment only with the appropriate wire size between the drive and idle rolls. On some cored or soft electrodes it may be necessary to set for a lower pressure to prevent crushing.

When shipped, the drive roll rotates clockwise to feed electrode down (see photo). If desired, the faceplate can be rotated 180° and the wire straightener and contact assembly locations switched. The drive roll rotation direction must be reversed by interchanging leads #626 and #627 from the wire feed motor plug at the terminal strip inside the control box.

E. CONTACT ASSEMBLIES

Several different contact assemblies are available. See Sec. T2.2.6, T2.2.7, T2.5.3 or T2.5.4 for installation instructions.

F. WIRE REEL

If 300 to 1000 pound Speed-Feed® reels or Speed-Feed® drums are to be used, see Sec. T2.5.7.

When ordered, the reel for 50 or 60 pound coils is shipped with the needed mounting shaft, hardware and insulation. Shaft mounting hole requirements are on the head dimension drawings.

Install the reel mounting shaft on the fixture or travel carriage so the wire goes as directly as possible to the wire straightener without going around any corners or touching grounded metal equipment. If it must be fed long distances, use insulated, friction-free guides rather than long tubes.

G. WIRE STRAIGHTENER

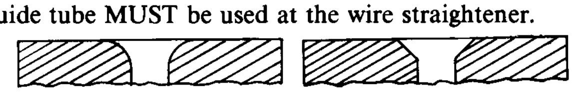
The NA-3S, NA-3SF, NA-4, NA-5S and NA-5SF models are shipped with a solid electrode straightener for 5/64" and larger wire.

The NA-3N, NA-3NF, NA-5N and NA-5NF models are shipped with one of the following:

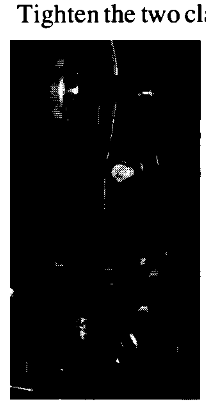
1. A flux-cored wire straightener for .045 thru 5/32" Cored electrode. It can also be used with 5/64" and 3/32" solid wire. For solid wires above 3/32", use the M8269-1 Solid Wire Straightener.
2. A tightly wound spring type wire guide for .035 thru 1/16" solid electrodes.

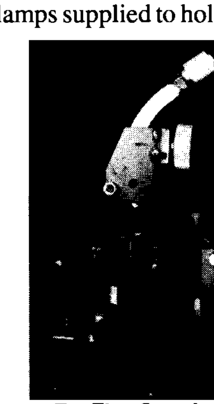
The various optional Twinarc® assemblies also include a twin wire straightener or wire guide as appropriate.

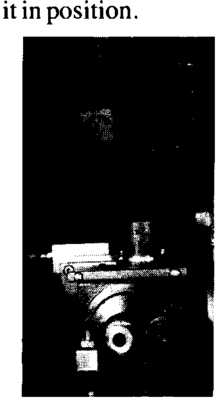
After the head is installed, fit the wire straightener or wire guide over the ingoing guide tube on top of the drive roll box. (The ingoing guide has a radius at the entrance shoulder — the outgoing guide is chamfered.) The ingoing (radius) guide tube MUST be used at the wire straightener.


INGOING OUTGOING

Turn the straightener so it points toward the wire reel. Tighten the two clamps supplied to hold it in position.


For 5/64" & Larger Solid Electrode.

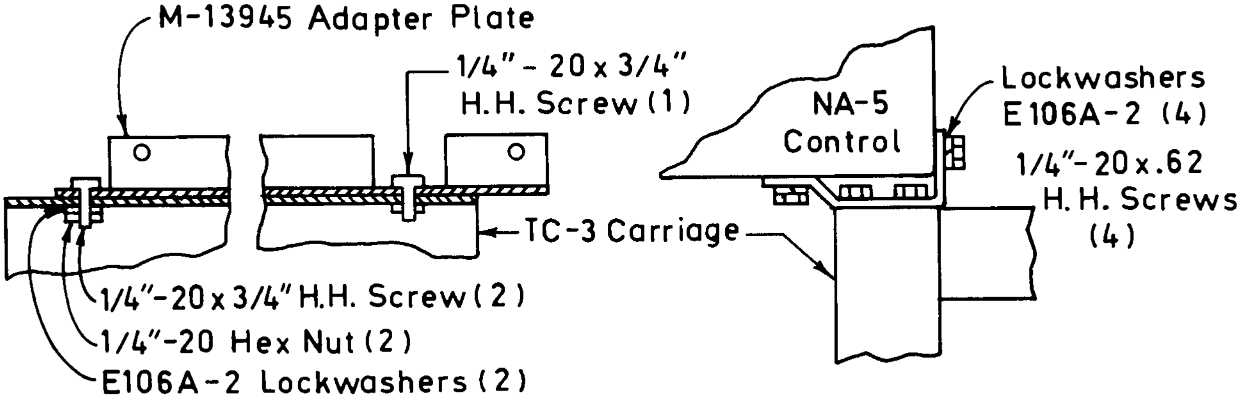

For Flux Cored Electrode.


For .035-1/16" Solid Electrode.

Sec. T2.2.3
Control Box Installation

The control box can be mounted either on the standard travel carriage or a separate fixture. It is electrically grounded by a lead in the input cable assembly.

When mounting to the travel carriage, use mounting kit T14469. Bolt the adapter plate to the top of the carriage using the hardware supplied. The NA-5 control box is then mounted to the adapter plate using four bolts and lockwashers, two from the bottom and two on the back.



For complete details on carriage operation, see Sec. T2.2.4.

If mounting the controls on a fixture, use the mounting holes provided in the bottom and/or back of the box. See dimension print S16717. The control box should be mounted so the controls and meters are convenient for the operator.

MECHANICAL INSTALLATION – CONT'D.

Sec. T2.2.4-C
(File as Sec. L2.2.4-C for IM-278)

K325 Travel Carriage Installation (Codes Above 8000)

The carriage is available in two versions: a Standard Carriage for normal loads and a High Capacity (HC) Carriage for heavy loads.

The units are convertible from standard to high capacity or from high capacity to standard by changing bearings and a few spacers.

The maximum equipment to be used with each type of carriage is shown in the following tables.

K325 STANDARD CARRIAGE (Carriage bearing width .472)

Single Wire Operation	Twin Wire Operation
1. Single head and control 2. Single wire reel 3. Vertical adjuster 4. Horizontal adjuster 5. Flux hopper 6. 75 lbs. of auxiliary equipment centrally located over carriage	1. Single head and control 2. Two wire reels 3. Vertical adjuster 4. Horizontal adjuster 5. Flux hopper 6. No auxiliary equipment

**K325HC HIGH CAPACITY CARRIAGE
(Carriage bearing width .866)**

Multiple Arc Operation		Tandem Twinarc
1. Two heads and controls 2. Two wire reels 3. Vertical adjuster 4. Horizontal adjuster 5. Flux hopper 6. 150 lbs. of auxiliary equipment centrally located over carriage	1. Three heads and controls 2. Three wire reels 3. Vertical adjuster 4. Horizontal adjuster 5. Flux hopper 6. No auxiliary equipment	1. Two heads and controls 2. Four wire reels centrally located over carriage 3. Vertical adjuster 4. Horizontal adjuster 5. Flux hopper 6. No auxiliary equipment.

It is important that the mounting of the heads, control boxes, wire reels and other equipment be done in such a manner that there is a minimum overhung weight. The head mountings are to be such that the heads are within the dimensions shown in Figure 1.

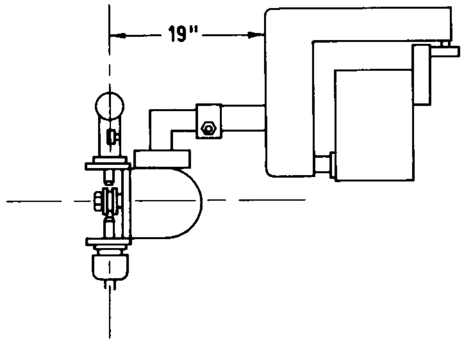


Figure 1

INSTALLATION

All carriages are factory assembled to fit an 8″ beam; for 10″ and 12″ beams see G1458 (NA-3, NA-4 and NA-5) for instructions for proper shimming.

NOTE: These carriages (above Code 8427) are equipped with a T13586-1 drive wheel with a helical tooth suitable for driving on a smooth drive rail. If the carriage is to be used with a beam drive rail having a straight cut knurl, it will be necessary to replace the drive roll with a T13586 drive roll (straight tooth) which must be ordered separately.

The carriage release handle, wire reel support bracket, and the head supporting bracket are not factory mounted. These three items should be mounted to the carriage before it is placed upon the beam (see instruction sheet M13297). After installing the wire reel shaft support and the head support, be sure both of these supports are electrically isolated from the carriage frame.

With the carriage release handle all the way down, set the carriage upon the beam. It should run freely along the entire beam length. With the release handle in the up position the drive gear should engage the track and hold the carriage securely in position.

Mount the control box on top of the carriage (see instruction sheet (M13297).

Insert the 3-prong plug (codes above 8300 use a 4-prong plug) of the carriage drive motor cable into the matching receptacle on the side of the control box. The carriage requires 250 volt-amperes of 115 volt, AC, 50 or 60 hertz power.

Keep the load on the carriage as uniform as practical. Install cables so they move smoothly with the carriage. Clamp the 4/0 electrode cables from the power source to the left rear corner of the carriage using the holes provided for the cable clamp. Suspend all cables off the floor to prevent excessive drag and damage to the cables.

For Twinarc installations, install the second wire reel as specified in the instructions shipped with the Twinarc kit.

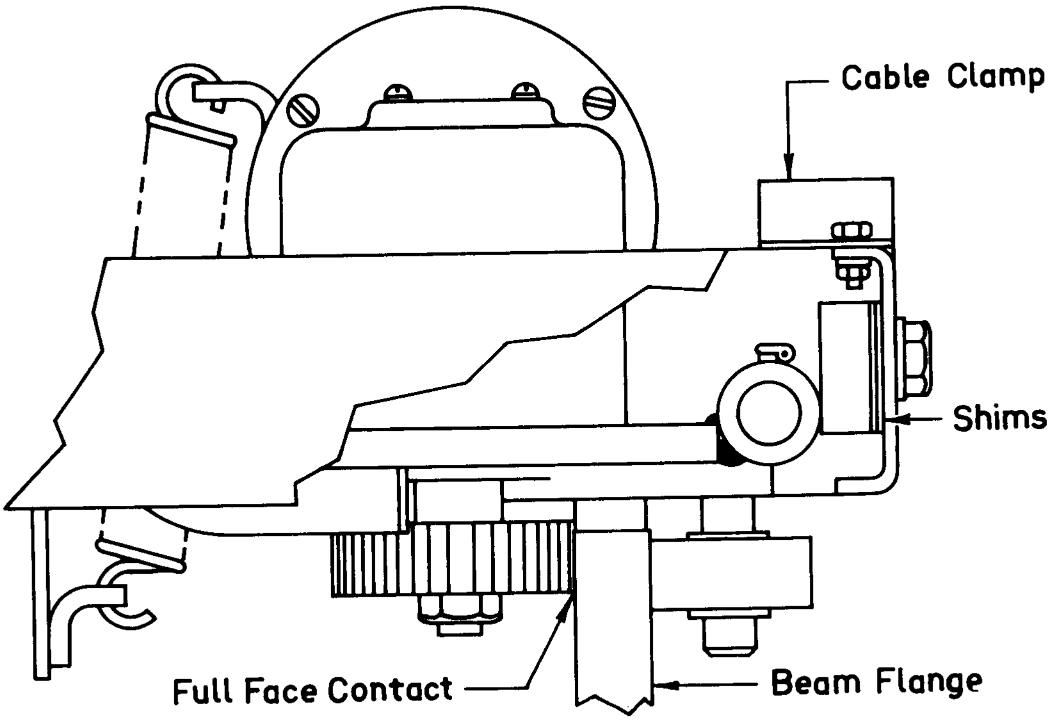
After all of the equipment (wire reel shafts, wire reel and wire, and control box) have been installed on the carriage, the tracking of the carriage bearings and the drive gear should be checked.

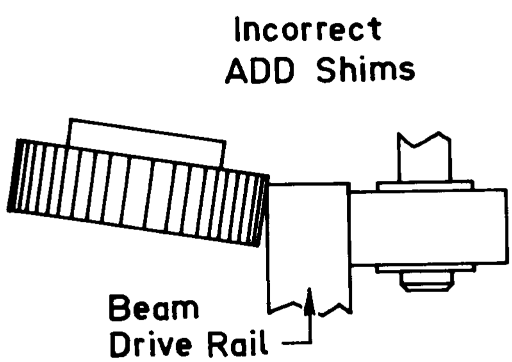
The carriage drive unit is properly shimmed at the factory so that the face of the driving gear is flat against a .88 thick beam flange when the release handle is in the up position. If the flange is other than .88 thick the shims under the gear box mounting brackets will have to be changed per Figure 2.

CARRIAGE BEARING TRACKING

The bearing tracking can be checked by placing a strip of white paper along the area over which each set of bearings ride. Disengage the release handle and move the carriage over these paper strips. If the carriage has been properly installed, the trace on each paper should show a uniform trace left by the bearing face.

Sec. T2.2.4-C (Continued)





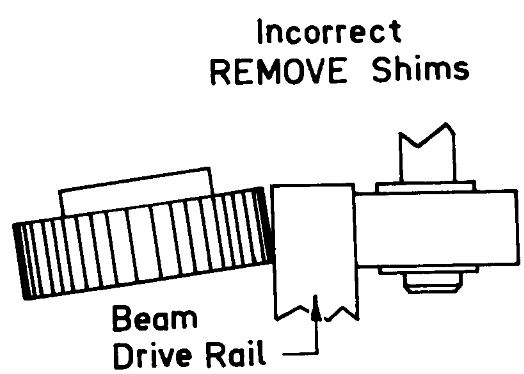
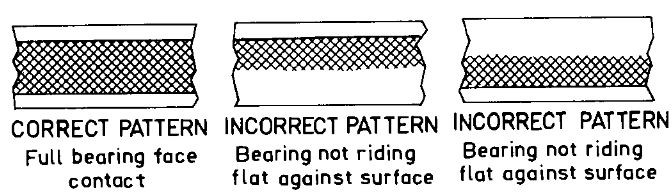
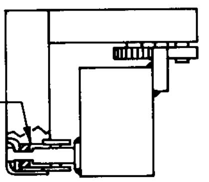


Figure 2



Sec. T2.2.4-C (Continued)
(File as Sec. L2.2.4-C for IM-278)

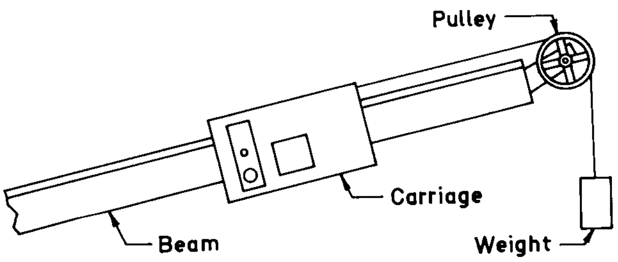
The out-of-squareness between the carriage and the beam can be corrected by shimming the lower bearing assembly bar:



INCLINED OPERATION OF CARRIAGE:

1. Beam should have knurled type driving flange.
2. When the tilt is 5° or under, no counter weight system is required as far as the loading on the carriage drive motor is concerned. However, see 'caution' below.
3. Beam tilt angles of greater than 5° will require a counter weight system as shown.

   The amount of counter weight will depend on the tilt angle and carriage loading.



4. Beam tilt angles should be limited to 10° or less.

   CAUTION: When the carriage is used in an inclined type of operation, the unit is free to roll whenever the travel release handle is pulled down. This may happen even if a counterbalance is used unless the wire reel and flux hopper (when used) are mounted off the carriage in which case their changing weight does not affect the counterbalance.

Each carriage is shipped with the gear ratio specified for the model ordered. The travel speed ranges are listed below. Although carriages operate at speeds down to zero, speed variations increase rapidly with uneven loading when travel speeds below the listed minimums are used.

(Standard or HC) Carriage	Gear Box Ratio	Carriage Speed in inches per minute
K325S	952-1	5–75
K325F	254-1	15–270

MAINTENANCE:

Periodically:

1. Disengage the release handle and see that the carriage moves freely along the beam.
2. Add a few drops of machine oil to each of the head lift bearings. This can be done through the front opening in the carriage.
3. Add a few drops of oil to clutch handle bearings.
4. Add a few drops of oil into each of the oil cups at the travel mounting pivot point.

   (No change of lubrication is required for cold temperature operation.)

Once a year:

1. Check the motor brushes. If .25 or shorter, replace with new.
2. Check the carriage drive gear teeth. If the teeth are badly worn, replace the drive gear.
3. After 5,000 hours of operation, the motor and the first reduction should be removed from the gear box, and all of the gear teeth should be re-coated with a good grade of graphite grease.

February 1982

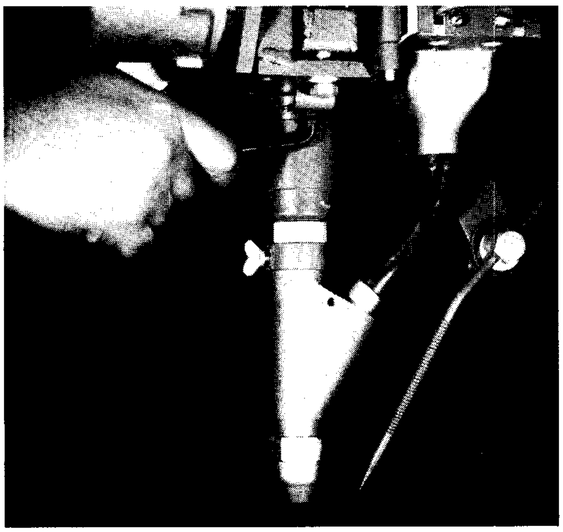
SEC. L2.2.6 SUBMERGED ARC CONTACT ASSEMBLIES

(Also See Sec. L2.2.7 for the K-148 nozzle when using high currents or Linc-Fill long stickout procedures.)

Sec. T2.2.6
(File as Sec. L2.2.6 for IM-278)
(File as Sec. 2.7.1 for IM-198)

A. K231 Contact Nozzle Assembly

(For NA models)

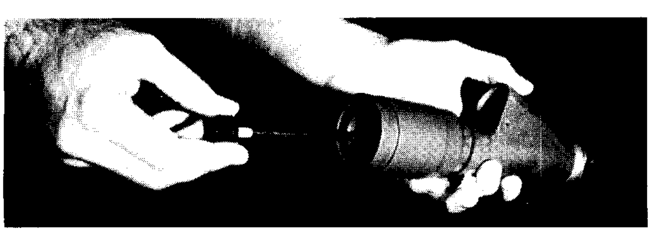


For submerged arc welding using currents generally under 600 amps. Higher currents can be used but result in faster tip wear. The outer flux cone deposits flux right around the arc for full coverage with minimum flux consumption.

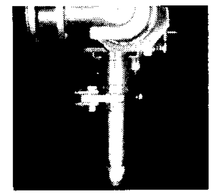
Contact tips for the electrode diameter specified on the order (5/64 thru 7/32") are shipped with each nozzle. A different contact tip is required for each electrode size used. Nozzles ordered for 5/64 and 3/32" electrodes also include a contact tip adapter. Screw the adapter into the nozzle and the tip into the adapter.

Installation — Nozzles ordered for feeding 5/64" and 3/32" electrode diameters include a liner. Insert the liner as shown in the following photo. Do NOT use the liner when the I.D. of the outgoing tube is larger than .125". These larger I.D. guide tubes are shipped with some wire feeders built to feed 3/32" and all wire feeders built to feed larger electrodes.

NOTE: Changing to a different diameter wire may necessitate changing drive rolls and the ingoing and outgoing guide tubes. See P-100-D for the correct parts.



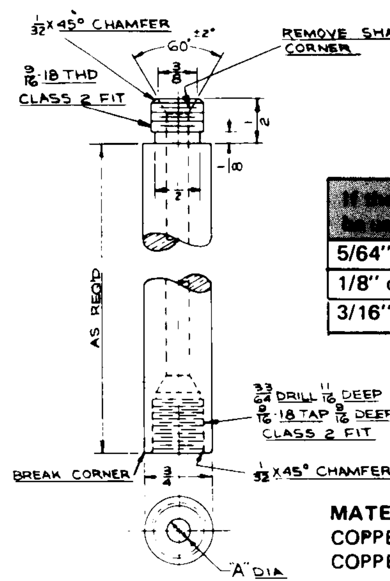
Slip one end of the rubber flux hose shipped with the nozzle onto the valve tube below the flux hopper. Fit the short insulating tube in the other end of the hose and then insert into the hole in the nozzle body. Do not push the tube in far enough to touch the nozzle.



Connect the electrode cable from the control box to the contact nozzle. Place one cable on top and one below the connection tab with the lugs flat against the tab and tighten the bolt and nut.

Operation — Do NOT completely straighten the electrode. A slight curvature is required in the electrode to insure good electrical contact inside the contact tip.

Extensions — When required the nozzle can be lengthened by making extensions per the following drawing. Screw the extensions into the nozzle body and screw the contact tip or small wire adapter into the extension. A flux tube of the appropriate length must be made for the installation. A 5" extension is available from The Lincoln Electric Company • Order Part # S12003



[illegible]	[illegible]
5/64" or 3/32"	1/8"
1/8" or 5/32"	3/16"
3/16" or 7/32"	1/4"

MATERIAL – HARD DRAWN COPPER or HEAT TREATABLE COPPER ALLOY

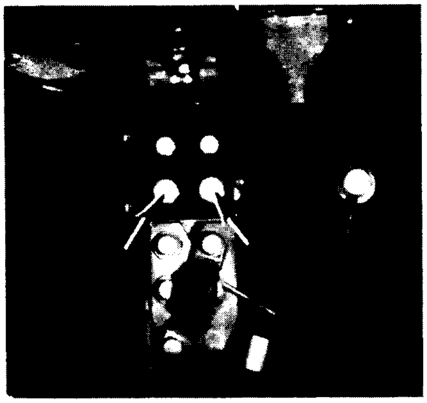
Maintenance — Replace the contact tip when it no longer provides accurate wire location or good electrical contact. Rusty and dirty wire or high currents increase tip wear. Always keep replacement tips in stock.

To replace the contact tip, first loosen the retaining wing screw and remove the flux cone. Then unscrew the tip and replace it.

The special socket head screw (Item 118 of P-101-M) holds the nozzle body to the insulator. If the nozzle body becomes loose, remove the nozzle from the head, tighten the screw and reassemble the nozzle.

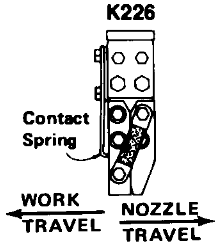
B. K226 Contact Jaw Assembly

(For Models NA-3, NA-4 and NA-5)



For submerged arc welding generally at currents from 600 to 1000 amps. Model K266T with two tapered jaws feeds 3/32" and 1/8" electrodes. K226R with one tapered and one rectangular jaw feeds 1/8" thru 7/32" electrodes. The braided shunt is not included with the K226T.

Installation — Insert the outgoing wire guide from the wire feed mechanism into the top of the contact assembly body. Install the assembly in position on the bottom of the wire feed mechanism with the pressure spring as shown in the following sketch and lock it in position with the two screws provided with the assembly (**Note:** By removing the four screws which hold the body to the mounting block, the jaws can be rotated to the appropriate one of four positions 90° apart.)



Connect two electrode cables coming from the control box to the contact jaws by placing one under each of the 1/2-13 nuts on the assembly (see arrows in photograph) with the cable lugs flat against the copper and tighten the nuts.

Slip the rubber tube shipped with the contact assembly onto the valve below the flux hopper. (If installing other rubber tubing, be sure it is non-conductive.) Fit the copper tube in the other end through the clip on the jaw assembly.

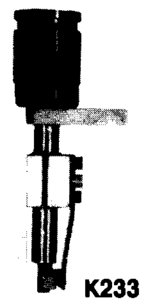
Maintenance — Rusty or dirty wire and excessively high currents increase jaw wear. When arcing occurs in the jaws or the wire becomes loose in the jaws, remove the jaws and dress them down by filing. When an excessive amount of material is worn off, replace the jaws. Contact jaws manufactured after April, 1979 have replaceable contact inserts (refer to P-101-N).

The contact jaws must be kept in line with the wire guides. To align the contact jaws, loosen the stationary contact jaw (Item 25 of P-101-N). Release the tension on the movable contact jaw (Item 21) by loosening the screws holding the strap spring (Item 18). Place a straight 14" piece of bare 5/32" wire up through the wire guide and into the drive rolls. Adjust the stationary contact jaw so the electrode touches the jaw at the center of the groove for the entire length of the jaw. Tighten the screws. Remove the piece of bare wire. Apply the tension to the movable contact jaw by tightening the screws holding the strap spring. Be certain the movable contact jaw moves freely after these screws are tightened.

C. K233 Small Wire Contact Nozzle

(For Models NA-3, NA-4 and NA-5)

For submerged arc welding with .035" thru 3/32" diameter electrodes.



K233

Unless a separate K219 Flux hopper kit was ordered, a T10642-11 flux hose must be purchased. A S7748-35 hose tip must also be purchased separately.

Installation — Depending upon the electrode size specified when the nozzle was ordered, either a liner for .035 thru .052" electrode or for 1/16" thru 3/32" electrode is shipped with the assembly. Insert the appropriate liner into the nozzle body with the adapter ring on top.

Insert the outgoing wire guide from the wire feed mechanism into the top of the nozzle body and place the nozzle in position on the bottom of the wire drive mechanism.

Operation — A pressure shoe and contact tips for the electrode diameter specified on the order are shipped with each assembly. A different contact tip is required for each electrode size used.

The electrode is automatically held against the nozzle contact tip with a preset pressure to assure good electrical contact. Because the electrode is held against the tip, it tends to wear a groove in the tip. When the groove becomes too deep to maintain good electrical contact, the tip must be replaced.

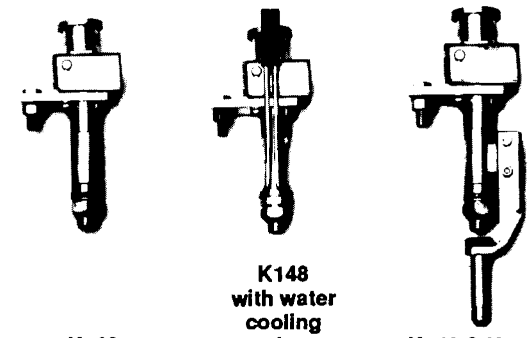
A groove is also worn in the contact pressure shoe. This shoe has two chamfered edges 90° apart. When a groove is worn in one direction, remove the shoe, turn it 90° and replace it so the second chamfered edge fits into the contact tip. This provides a new wearing surface. When both wearing surfaces are grooved, replace the shoe.

FOR SUBMERGED ARC AND WELDING WITH INNERSHIELD® ELECTRODES

K148 Contact Nozzle and K149 Linc-Fill™ Long Stickout Extension

Sec. T2.2.7
(File as Sec.L2.2.7 for IM-278)
(File as Sec.M2.2.7 for IM-279)

This nozzle can be used with the NA-3, NA-4 and NA-5 wire feeders. K148A is designed for 3/32" and 1/8" wire sizes. K148B is designed for 5/32" and 3/16" wire. K148C is designed for .068" to 5/64" wire.



K148 | K148 with water cooling attachment | K148 & K149

Current Ratings

A. Without Linc-Fill Attachment

Innershield welding:
600 amps, 100% duty, no water cooling
1100 amps, 100% duty, with water cooling

Submerged arc welding:
1100 amps, 100% duty, no water cooling

B. With K-149 Linc-Fill Attachment

Innershield or Submerged Arc
1100 amps, 100% duty, no water cooling

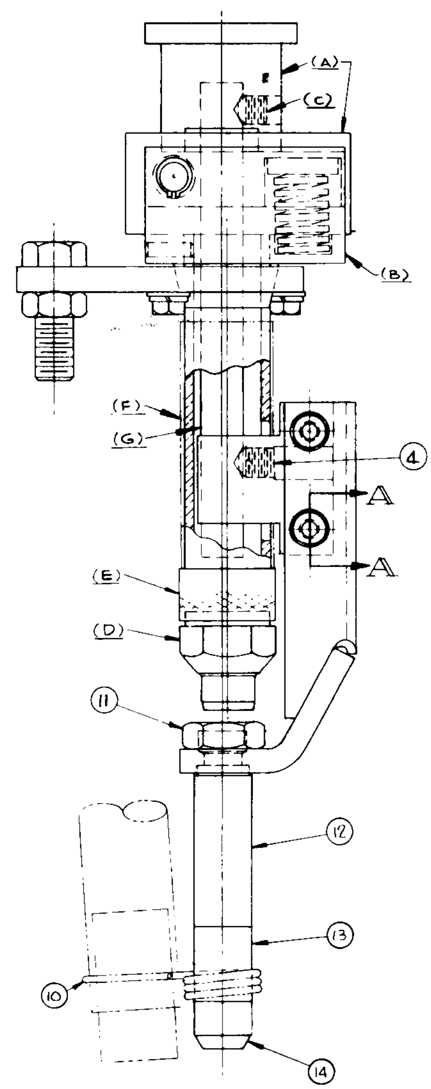
Water Cooling Attachment

When using currents over 600 amperes at high duty cycles water cooling always increases contact tip life. The cooling attachment is ordered as a separate item, Part No. T12928. Installation instructions are included in the kit.

The Magnum Water Cooler 20 saves water and is recommended for most applications. The other solution is to connect the attachment to the water supply and the drain with rubber tubing obtained locally. Water flow should be between 1/2 – 1 gallon (1.9 – 3.8 L) of tap water per minute.

K149 Installation

1. Install the K149 attachment before mounting the K148 nozzle on the welder.
2. Place a small C-clamp on the spring supporting members (A) and (B) in such a manner that the spring can be compressed. Look up the hole in the end of contact tip and tighten the C-clamp until the backup tang lifts off the surface.
3. Remove the 3/8" (9.5 mm) set screw (C) in the body (A).
4. Remove the contact tip clamping nut (D) and the contact tip.
5. Remove the brass thread protecting collar (E).
6. Remove the window cover (F) from unit.
7. Slide the center guide (G) up out of the pivot body until the tang is above the window.
8. Place the Linc-Fill guide assembly into the nozzle window, and then lower the center guide tube (G) back down to its original position.



9. Line up the spot at the top of the center guide tube (G) with the 3/8" (9.5 mm) tapped hole in the upper pivot block (A) and put the 3/8" (9.5 mm) set screw (C) back into the hole and tighten securely.
10. Line up the lower spot in the center guide tube (G) with the 3/8" (9.5 mm) set screw (Item 4) and tighten this securely.
11. Replace the brass thread protecting collar (E). It is important that this protecting collar be pulled up against its locating shoulder, otherwise the tip locking nut will not clamp the tip securely.
12. Replace the contact tip and its clamping nut (D) and tighten securely.
13. Assemble the proper combination of extension guides (Items 12, 13 and 14) with locking nut (Item 11) for the welding procedure to be used.
14. If Submerged Arc welding is being used, screw the flux hose clamp (Item 10) onto the extension housing.

K148 Nozzle Installation

To install the nozzle on the head, insert the outgoing wire guide from the head into the nozzle assembly. Place the combined assembly in position on the bottom of the wire feed roll box. Clamp it in place using the two clamps supplied with the head.

Before pulling the clamps up tight the nozzle must be positioned relative to the travel direction as shown in Figure 1. This position is set so accidental contact between the work and the nozzle will not compress the contact pressure spring. If positioned otherwise, such accidental contact may cause arcing inside the contact tip.

After the nozzle is positioned in the proper relationship with the travel direction, the connector tab for the electrode cables can be moved to any of four positions 90° apart. To change the tab, remove the two 1/4-20 hex head screws. Tap the connector tab to loosen it from the tapered collar on the nozzle body. Turn the tab to the desired position. Replace and tighten the 1/4-20 screws.

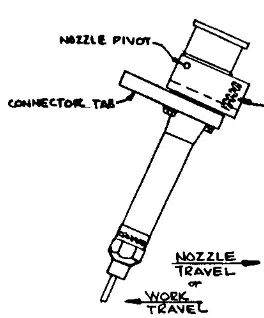


Figure 1

Operation

The same contact tip, S13763, is used for 3/32" (2.4 mm) through 3/16" (4.8 mm) diameter electrodes. S16388 is used for .062 (1.6 mm) and 5/64" (2.0 mm) electrode.

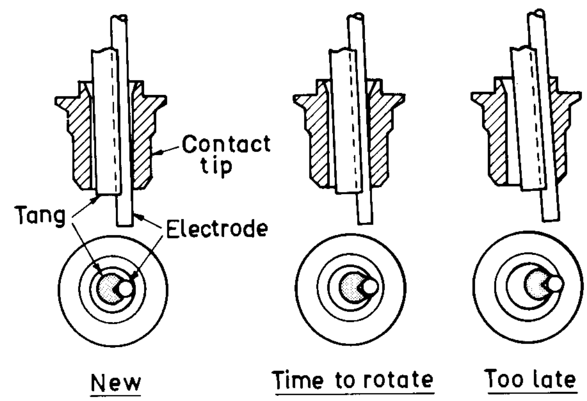
Loading of Wire

Straighten the start end of the coil for at least eight inches, pass the end down through the appropriate wire straightener. Inch the wire through the wire feeder and the nozzle. When using .062 (1.6 mm) or 5/64" (2.0 mm) Innershield electrode with a K148-C nozzle, make sure that the wire is in the "vee" groove of the pressure tang. Idle roll pressure settings should be made per marks on the idle roll arm, except for the smaller diameter electrodes. For the .062 (1.6 mm) and 5/64" (2.0 mm) wire sizes, back off on the idle roll pressure so that there is little or no flattening of the wire.

Because the electrode is held against one point of the contact tip, it wears a groove at that point. When the groove is about one half the diameter of the electrode, rotate the contact tip to a new position per the instructions below. Careful positioning of the contact tip will provide four to six wear spots depending upon the electrode size.

When welding with the small diameter electrodes, it will be necessary to change contact position more frequently since the amount of tip wear that can be tolerated is much less. The tang should never be allowed to touch the I.D. of the contact tip. To do so will allow welding current to go through the tang, causing electrical wear and overheating of the tang and contact tip.

If the groove is allowed to wear until the tang touches the I.D. of the contact tip, welding current passes through the tang. This causes electrical wear and overheating of the tang and contact tip.



To rotate the tip, clip the end of the electrode and inch it up until it is free of the contact tip. Loosen the locking nut about one-half turn and pull the nozzle body to relieve the pressure of the tang against the inside of the contact tip hole. At this moment rotate the tip the proper amount and then retighten the locking nut.

To install a new contact tip proceed as follows:

1. Clip the end of the electrode and inch it up until it is free of the tip.
2. Remove the contact tip locking nut.
3. Relieve the spring pressure of the contact tip against the steel tang in the hole of the contact tip. To do this, push the nozzle body so the steel tang is approximately centered in the 3/8" (9.5 mm) hole in the contact tip. Under these conditions the contact tip can be easily removed from the nozzle body.

Sec. T2.2.7 (Continued)
(File as Sec. L2.2.7 for IM-278)
(File as Sec. M2.2.7 for IM-279)

4. a. Before installing the new tip, make sure the threads and the bottom surface of the nozzle are clean and bright. These surfaces are current carrying areas and must be clean.

   b. Push the nozzle body to one side and insert the new contact tip.

5. a. Check the locking ring threads making sure they are free of any foreign material. A small application of high temperature anti-sieze compound on these threads insures a longer thread life of the two mating parts. Suggested anti-sieze compounds are Graphite grease per Lincoln specifications E-2067 and "Anti-Sieze and Lub. Compound" made by Never Seez Compound Corporation, 2910A. 18th Ave., Broadview, Illinois.

   b. Replace the locking ring and tighten securely.

6. Check the contact tip to be certain it is tight in the nozzle body. If the tip is not tight, arcing will take place between the tip contact surface and the nozzle contact surface which will damage the nozzle body.

April 1988

Sec. T2.2.8
(File as Sec.L2.2.8 for IM-278)

For Submerged Arc Welding K285 Concentric Flux Cone

The concentric flux cone was designed to fit on the K148 alone, K148 with a K149, the K129 and K391 nozzles. (The maximum electrical stickout when using the K149 will be four inches.) Use of this attachment results in the flux being fed concentrically around the electrodes.

The unit consists of two members that are electrically insulated from each other. One of the members is fastened to the nozzle body with two worm-type hose clamps. The second member is adjusted up and down on the stationary member to the desired height and then locked in position with a wing screw. The moving member supports the flux hose and the concentric copper flux cone.

NOTE: The concentric flux cone does *not* have suitable insulation for use with high frequency starting.

I. INSTALLATION

A. K148 Nozzle

1. Remove spring pressure on center guide tube by applying a "C" clamp as shown in Figure 1. *Apply only enough clamping force to relieve the tang pressure from the I. D. of the tip.*

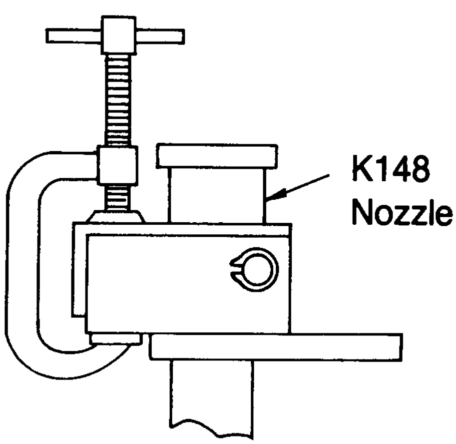


Figure 1

2. Remove the nut holding the contact tip in place. Remove the contact tip.
3. Remove the secondary threaded collar which will allow the dirt shield to come off the barrel of the nozzle.
4. Make sure that all threads and contact surfaces are clean and bright, then replace the threaded collar, contact tip and the tip locking nut. Tighten both the collar and the tip locking nut securely.
5. Remove the "C" clamp, releasing the internal guide.
6. Unscrew the hose clamps entirely so that the open ends may be placed around the body of the nozzle. Put the hose clamps back together and tighten the clamps with the stationary part of the cone mounting covering up the opening in the nozzle body.
7. Position the moving member to the desired height of flux coverage and tighten the wing screw into the top tapped hole. See Figure 2.

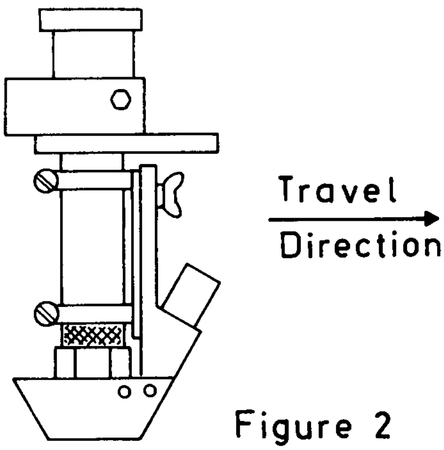


Figure 2

8. Connect flux hose from hopper to the flux entry port on the concentric flux cone arm (cut the hose length to suit).

B. K149 Linc-Fill Nozzle

1. Unscrew the hose clamps entirely so that the open ends may be placed around the body of the nozzle. Place the stationary member of the unit directly opposite the arm coming out of the window of the nozzle, put the hose clamps back together and tighten. The stationary member should be positioned as shown in Figure 3.

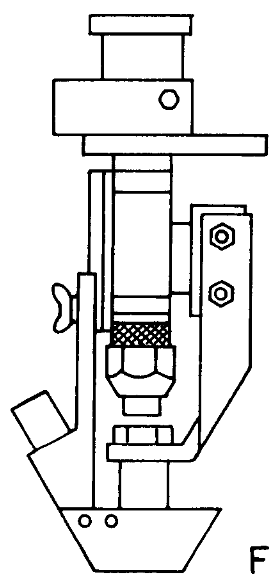


Figure 3

2. The lower hose clamp must be placed and tightened in a position where it does not touch the outboard long stickout arm of the K149 nozzle.
3. Position the moving member to the desired flux coverage and then tighten the wing screw. (Use middle or lower tapped hole – depending upon E.S.O.) The arm can be lowered to cover 4.00 inch electrical stickout.
4. Connect flux hose from hopper to the flux entry port on the concentric flux cone arm (cut the hose length to suit).

C. **K129 Type Twinarc Nozzle**

1. Unscrew the hose clamps far enough so that they can be slipped up over the tip holder clamping nut.
2. Position the stationary member as shown in Figure 4 and then tighten the hose clamps.
3. Position the moving member to the desired height and tighten the wing screw.
4. Since the tips and the wire come out of the nozzle at 7°, there will be some occasions where the cone will have to be tilted as shown. Provisions have been made to accomplish this by removing the furthermost screw from the tip on each side of the cone, then tilting the cone and putting the two screws back into the rear holes of the cone. Retighten all four screws. See Figure 4.
5. Connect the flux hose from the hopper to the flux entry port of the concentric cone arm (cut the hose length to suit).

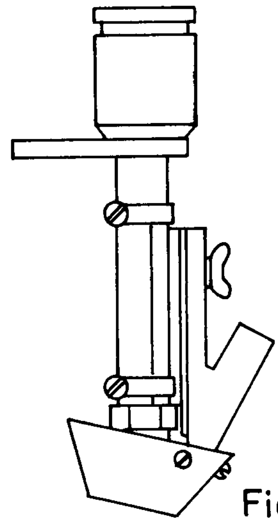


Figure 4

D. **All Nozzles**

After the installation to any of the three nozzles has been completed, a continuity check should be made between the copper flux cone and the nozzle body. This can be done by using an ohmmeter or test light. If meter reads zero, determine where the "short" is and correct the situation, otherwise the copper cone will be at electrode potential and if it should touch the ground during the welding operation the cone will be damaged.

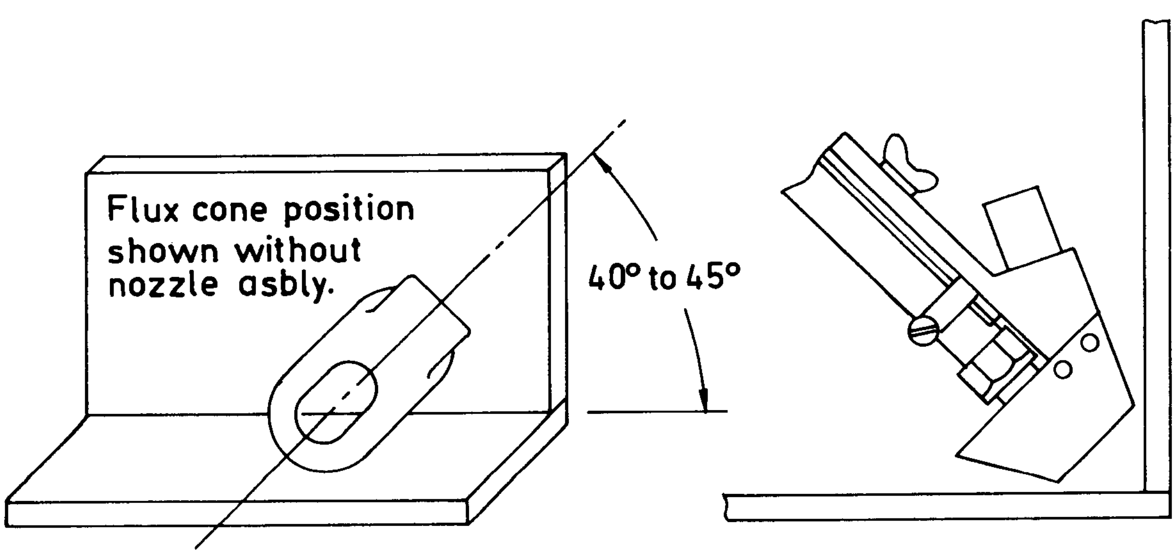


Figure 5

Sec. T2.2.8, L2.2.8 and 2.7.8 (Continued)

II. GENERAL OPERATING COMMENTS

A. Nozzle positions for Horizontal Fillets

1. K148 or K148 with K149.
   After the concentric flux unit has been fastened to the nozzle body (per Section I, A or B), set the nozzle to the proper electrode angle dictated by the procedure. Loosen the two hold down clamps which fasten the nozzle to the face plate, rotate the entire nozzle assembly approximately 40 to 45° and then retighten the clamps. Inch the electrode out of the nozzle to the proper E.S.O. Position the wire into the joint configuration, then slide the concentric cone down so that it is approximately .12 of an inch away from the vertical and the horizontal surfaces to be welded. Tighten the wing screw. See Figure 5.

2. K129

   After mounting the concentric cone to the nozzle (per Section I, C) set the head and nozzle for the proper electrode angle per procedural requirements. Inch the electrode out of the tips to the proper E.S.O. Place the nozzle into the welding position. Loosen the clamps and rotate the concentric flux cone unit approximately 40 to 45°. Retighten the clamps.

   Loosen wing screw, allowing the cone assembly to slide down within .12 of an inch of touching the piece to be welded. See Figure 5.

B. Flux Hopper Mounting for Horizontal Fillets

For horizontal fillet welding the flux hopper will not function properly if it is fastened to the face plate of the NA-3 or NA-5. The hopper should be mounted directly above the flux entry of the concentric flux cone unit. Flux hose angles should be no greater than 35° from the vertical plane to insure good flux flow from hopper to cone.

C. Usage On Deep Narrow Grooved Welds

For narrow deep groove welding it may be necessary to remove the copper cone from the moving arm.

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MECHANICAL INSTALLATION - CONT'D

Sec. T2.2.11
(File as Sec. L2.2.11 for IM-278)
(File as Sec. E2.7.7 for IM-245)

K29 Vertical Head Adjuster

A. ASSEMBLY

Automatic welding applications frequently require raising and lowering the head assembly. The Vertical Head Adjustment provides a quick, simple and easy method of doing this. A height variation of four inches can be achieved with this attachment.

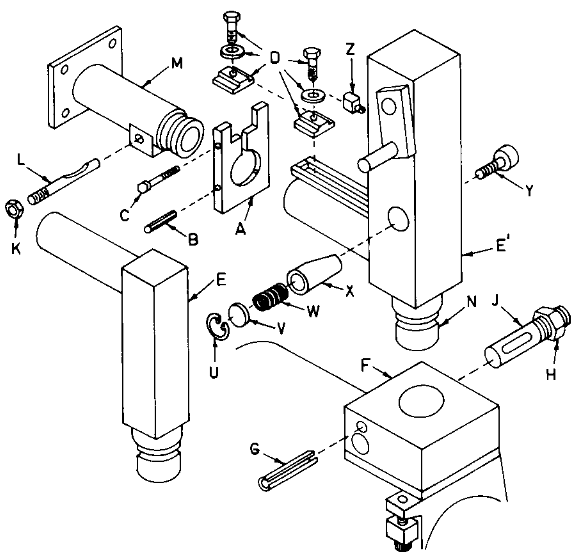


Fig. 1 — NA-2, NA-3, NA-4 and NA-5

B. INSTALLATION

Check the carton for the following items:

1. Head adjustment lock (A).
2. 1/4" diameter roll pin (B).
3. 1/2" — 13 × 2.75 hex head lock screw (C).
4. Two adjustable clamps and their respective screws and washers (D).
5. Vertical head lift adjuster (E').

To install proceed as follows:

1. Be sure nut (H) is tight. Drive out roll pin (G).
2. While holding the head, loosen nut (H) and lower the head (F) from the head support (E).
3. Loosen the nut (K) on the draw bolt (L); now remove the stationary mount (E), (not shown in Fig. 2).
4. Slide the clamp ring (A) over the end of the mounting bracket (M).
5. Drive the 1/4" roll pin (B) into clamp ring (A) when the hole in the ring lines up with the groove in the mounting bracket (M).
6. Tighten the clamp ring (A) with the open slot in the up position, using the 1/2" clamping bolt (C).
7. Slide the vertical head adjustment unit (E') into the mounting bracket (M). Tighten the draw bolt nut (K).
8. Install one adjustable clamp (D) on each side of the clamp ring (A).
9. If a horizontal adjuster is to be used, install it now per instructions in Sec. T2.2.12.
10. Raise the welding head (or horizontal adjuster) back into position on the up and down lift shaft (N). Drive the 5/16" roll pin (G) back into its original position.
11. Tighten draw bolt nut (H).

C. ADJUSTMENT AND LOCKING ARRANGEMENT

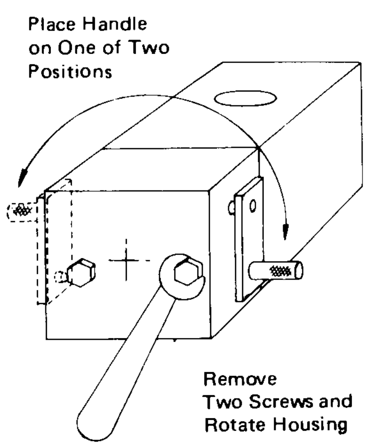
The rotational movement of the lift mechanism is kept to a near zero level at all times because the spring loaded wedge shaped pin is always in intimate contact with the vertical slide. The socket head screw on the right side of the lift housing is used as a locking screw. Its function is to pull the wedge tight against the vertical slide and thus lock the unit at a desired height. This screw should always be a half turn loose unless a locked condition is wanted. *Extreme* tightening of the locking screw may lock the wedge so that the lift cannot be moved in either direction. If this should occur, loosen the locking screw a turn or two and tap the screw into the head lift body. This will loosen the locking wedge.

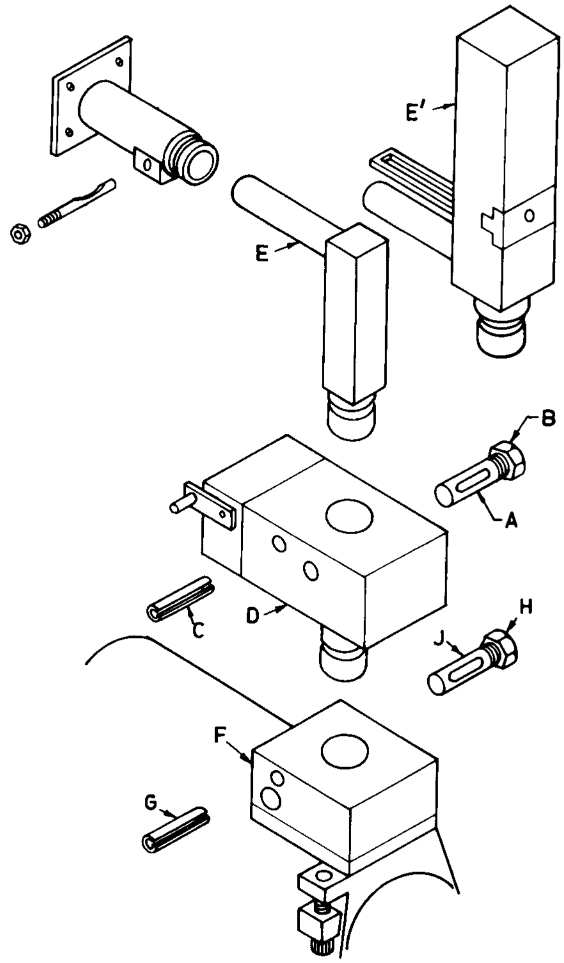
Sec. T2.2.12
(File as Sec. L2.2.12 for IM-278)
(File as Sec. E2.7.8 for IM-245)

K96 Horizontal Head Adjuster

This accessory provides an easy means of moving the head in a horizontal direction by simply turning a crank handle. Install per the following:

1. Be sure nut (H) is tight. Drive out roll pin (G).
2. While holding the head, loosen nut (H) and lower the head (F) from the head support (E) or (E').
3. If a vertical lift adjuster is to be used, install it now per instructions in Sec. T2.2.11.
4. With draw bolt (A) and nut (B) in place, fit the horizontal adjuster (D) to the stub shaft of (E) (or the vertical lift adjuster (E') if it is installed).
5. Drive in the roll pin (C) which comes with the adjuster (D).
6. With the draw bolt (J) and hex nut (H) in place, fit the head (F) to the stub shaft on the bottom of the horizontal adjuster (D). Tighten nut (H).
7. Drive in the roll pin (G) removed in step 1.
8. Place the crank housing on the adjuster (D) in the more convenient of the two positions indicated in the sketch by removing the two screws, rotating the housing 180° and tightening the screws.





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SEC. T2.3 – ELECTRICAL INSTALLATION

Sec. T2.3.1
Wiring the Equipment

⚠WARNING



ELECTRIC SHOCK can kill.

- **Have an electrician install and service this equipment.**
- **Turn the input power off at the fuse box before working on equipment.**
- **Do not touch electrically hot parts.**

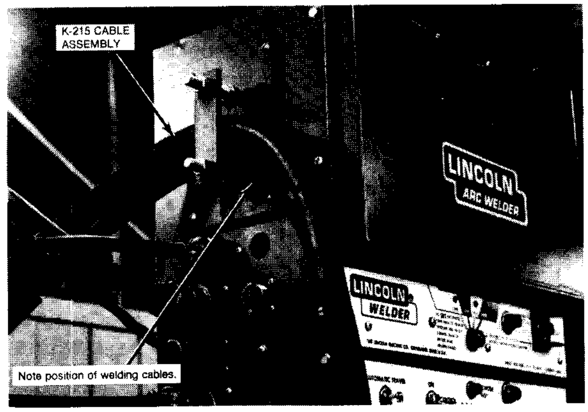


Figure 1

A. INPUT POWER REQUIRED

The only power required for operation of the control is 115 volts AC, 50 or 60 Hz.

All power sources covered in Sec. T2.3.4 provide the required power. If there is no connection diagram available for a particular power source, the power source is not suitable for use with the NA-5.

B. CONNECTION OF HEAD TO CONTROLS

All heads include a 4-foot motor and motor tachometer cable. Insert the plugs on these cables into the matching receptacles on the side of the control box.

If the control box is to be mounted so the 4-foot cables are not sufficient, install a K335 or K338 Control to Head Extension cable of the length ordered (up to 30 feet). The K335, for the NA-5S head, includes motor, tachometer and flux hopper lead extensions with polarized plugs on each end and electrode cables. The K338 for the NA-5N, NF, and SF heads, is the same as the K335 *without* the flux hopper lead extension.

The NA-5N and NA-5S also include two 4-foot lengths of electrode cable. Bolt the terminals of one end of the cable pair to the wire contact assembly and the terminals of the other end to the electrode leads to the K215 Power Source to Control cable assembly. Properly insulate the bolted connection. When the K335 or K338 extension cables are used between the controls and heads, the 4-foot lengths of electrode cable are not used. If currents or duty cycle higher than 1000 amperes at 80% duty cycle will be used, add additional electrode cable per Table 1.

The "F" models do not include the 4-foot lengths of electrode cable as standard. If not using a K335 or K338, for the NA-5NF or NA-5SF order an appropriate length of the needed electrode cable. Connect it between the wire contact assembly and the K215 cable assembly as described above.

TABLE 1

	80% Duty Cycle
Below 1000 amps	Two 4/0
1000 to 1300 amps	Three 4/0
1300 to 1500 amps	Four 4/0

C. CONNECTION OF CONTROL TO POWER SOURCE CABLE ASSEMBLY

At the NA-5 control, in order to activate the NA-5 weld current sensing switch, the electrode cables of the K215 cable assembly must be placed under the clamp bar on the left hand side of the control box. See Figure 1. (This is necessary for proper operation of the reed switch.) The nuts holding the clamp bar in place need only be pulled up snug. Do not over tighten. If a carriage is used, the electrode cables should also be clamped to it with the cable clamp supplied on the carriage. Do not clamp the control cable under the travel carriage clamp, but route it over its top.

Insert the polarized connector of the control cable in the K215 assembly into the matching receptacle on the side of the control box.

With the power source off, connect the K215 Power Source to Control cable assembly to the power source as follows:

1. If using a multiprocess power source (SAM, SA-800, SAF-600, DC-400, DC-600, DC-1000 or DC-1500 types), be sure it is properly set for the welding process being used per the connection diagram.
2. Connect the K215 control cable leads to the power source terminal strip exactly as specified on the appropriate connection diagram. Include all jumpers on the terminal strips as shown on the diagram. *Do not* put on any other jumpers. If currents or duty cycle higher than 1000 amperes at 80% duty cycle will be used, add additional electrode cables to the K215 assembly per Table 1.
3. Depending on the power source and process to be used, the jumpers on the NA-5 Voltage Board may have to be changed. As shipped, the NA-5 is connected for use with the DC-400, DC-600, DC-1000 or DC-1500 type power sources. For other power sources, refer to the appropriate connection diagram and Sec.T3.6.
4. Connect work leads of sufficient size and length per Table 1 between the "To Work" stud on the power source and the work. Be sure the connection to the work makes a tight and clean metal-to-metal contact.

Sec. T2.3.1 (Continued)

D. ELECTRODE POLARITY

Polarity is changed by operating the polarity switch on the power source if so equipped or by interchanging the welding leads on the power source output studs.

IMPORTANT: WHEN CHANGING POLARITY ON INSTALLATIONS USING THE DISCONTINUED K224 SOLID-STATE REMOTE CONTROL:

Turn generator off and allow it to come to a *complete stop* before changing polarity. The polarity switch on the solid-state remote field control and the power source polarity must be set to the same polarity. Failure to do so will result in blowing the fuse in the solid-state remote field control and loss of generator output.

The polarity of the NA-5 control circuit is shipped connected for electrode positive. If electrode negative is required, two leads inside the NA-5 control must be reversed. Proceed as follows:

Turn off the input power to the NA-5 control box by turning off the welding power source. Open the control box door and locate the terminal strips mounted on the back of the box in the lower left hand corner. On the right end of the lower terminal strip, interchange the black and white leads going to the terminals marked (+) and (−). The black lead (No. 67) must be connected to the same polarity as the electrode welding lead, i.e. if the electrode is positive, connect the black lead to the (+) terminal on the terminal strip. The white lead (No. 21) is connected to the opposite polarity terminal.

E. TRAVEL MECHANISM

115 volt AC power to drive the standard Lincoln travel carriage or for starting and stopping other travel mechanisms is obtained from a receptacle on the control box. This



is a 4-prong receptacle connected to leads #531, #532, #25, and a grounding lead. Leads 531 and 532 are 115 volts AC. Leads #25 and #531 are 115 volts AC with #25 connected through the wire feeder travel switching circut for manual or automatic starting and stopping. (See Sec. T2.2.4-C for completed details on the K325 Travel Carriage.)

F. ARC AND TRAVEL STARTING AND STOPPING

Various sequences for starting and stopping the arc and travel are possible with standard machines or optional features. The choice of sequences depends upon the specific requirements of the procedures and application. See Sec. T3.5.2 for a description of these sequences and the needed reconnection instructions.

G. SPEEDMETER CALIBRATION

The jumper on the NA-5 Speedmeter board, located on the backside of the NA-5 door behind the digital speedmeter, is factory shipped connected to Pin "95" which is correct for a 95/1 NA-5 head ratio using the S12514 drive roll.

For NA-5 heads with other ratios or drive rolls, the jumper must be reconnected per chart below:

Speedmeter Pin	NA-5 Head Ratio	Drive Roll Part No.	NA-5 Head "K" No.	Wire Size Range		Rated Speed Range (in/min)
21[3]	21/1	S12778	K579-1 K580-1 K581-1	Single	.035 – .052	100-2070
57F[1]	57/1	S12778 or S19113	K331C K332C	Single	.035 – .052 Solid or .045 – .052 Cored	40-778
57[1]	57/1	S12515	K331B K332B	Single	1/16 – 3/32	38-762
95	95/1	S12514	K331A K332A	Single	3/32 – 5/32	22-428
95S[2]	95/1	S12515 or S19113	K346B K347B	Single	1/16 – 3/32 or .045	23-456
95S[2]	95/1	S13161-.052 S13161-5/64 S14904 (outer) S14905 (inner)	K346B K347B with K129 or K239	Twin Twin Twin	.045 – .052 1/16 – 5/64 3/32	23-456
142	142/1	S12514	K346A K347A	Single	3/32 – 7/32	15-289
142T[2]	142/1	S14904 (outer) S14905 (inner)	K346A K347A with K225	Twin	5/64 – 1/8	15-300

[1] Earlier speedmeter pins were labeled 55F and 55 respectively.

[2] Earlier speedmeter P.C. boards did not include these calibration pins.

[3] Present on Hi-Speed NA-5 Speedmeter board (L8575-1) only.
(Standard on K579-1 NA-5 Hi-Speed Control, ordered separately for K356 Standard NA-5 Control.

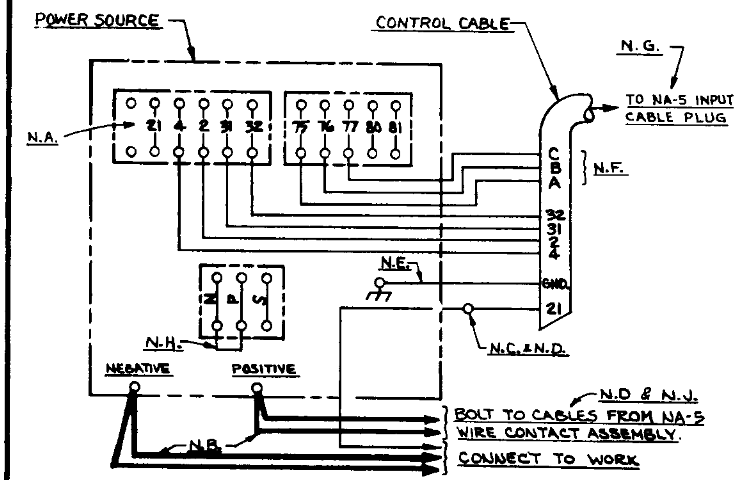
ELECTRICAL INSTALLATION – CONT'D

Sec. T2.3.4-A

Connection of NA-5 (All) to a DC-600

M-13968

CONNECTIONS MUST BE MADE EXACTLY AS SHOWN BELOW.
FOR ANY OTHER USE OF POWER SOURCE, DISCONNECT ALL NA-5 LEADS AND CABLES



NOTE: Above diagram shows electrode connected positive. To change polarity, turn power off, reverse the electrode and work cables at the power source and position the switch on power source to proper polarity. Refer to NA-5 operating manual for required NA-5 Control Box polarity connections.

DC-600
POWER SOURCE SETTINGS

ALL CODES:
TURN OFF INPUT POWER
Adjust the Power Source: DC-600:

1. Connect electrode cables to terminal of desired polarity.
2. Set toggle switch to same polarity as the electrode cable connection.
3. Set toggle switch to "Remote".
4. Set mode switch to the desired position for the process to be used.

DC-600 CODES 8000 - 8045:
For Sub Arc:

1. Set mode switch to CV Sub Arc.
2. White lead on Control P.C. Board is connected to Pin "M" and blue lead is connected to "W".

For all Open Arc Processes Except NR-302 and NR-203 Electrodes:

1. Set mode switch to CV Innershield.
2. White lead on Control P.C. Board is connected to Pin "M" and blue lead is connected to "W".

For NR-203 and NR-302 Electrodes:

1. Set mode switch to CV Innershield.
2. White lead on Control P.C. Board is connected to Pin "I" and blue lead is connected to "S".

DC-600 CODES 8046 - 8200:
For Sub Arc:

1. Set mode switch to CV Sub Arc.
2. White lead on Control P.C. Board is connected to Pin "M".

For all Open Arc Processes Except NR-203 Electrodes:

1. Set mode switch to CV Innershield.
2. White lead on Control P.C. Board is connected to Pin "M".

For NR-203 Electrodes:

1. Set mode switch to CV Innershield.
2. White lead on Control P.C. Board is connected to Pin "I".

DC-600 CODES ABOVE 8200:
For Sub Arc:

1. Set mode switch to CV Sub Arc.

For all Open Arc Processes:

1. Set mode switch to CV Innershield.

FOR OPTIMUM PERFORMANCE WITH THE NA-5, DC-600'S WITH CODES 8288 AND ABOVE ARE PREFERRED.

FOR ADDITIONAL INSTALLATION INSTRUCTIONS, SEE NA-5 OPERATING MANUAL

N.A. On earlier DC-600'S, #67 terminal was also on the terminal strip.

N.B. Welding cables must be of proper capacity for the current and duty cycle of immediate and future applications.

N.C. Extend lead #21 using #14 or larger insulated wire physically suitable for the installation. An S-16586-[ ] remote voltage sensing work lead is available for this purpose. Connect it directly to the work piece keeping it separate from the welding work cable connection to the work piece. For convenience, this extended #21 lead should be taped along the welding work cable.

N.D. Tape up bolted connection.

N.E. Connect the NA-5 control cable grounding lead to the frame terminal marked ⏚ near the power source terminal strip. The power source must be properly grounded.

N.F. If using an older K-215 control cable: Connect lead #75 to #75 on terminal strip, connect lead #76 to #76 on terminal strip, connect lead #77 to #77 on terminal strip.

N.G. The jumpers on the NA-5 Voltage Board must be connected as follows: Connect red jumper to pin "S". Connect white jumper to pin "B".

N.H. Connect a jumper from "N" to "P". There is no NPS terminal strip on DC-600 codes above 8200.

N.J. For proper NA-5 operation, the electrode cables must be snugged under the clamp bar on the left side of the NA-5 Control Box.

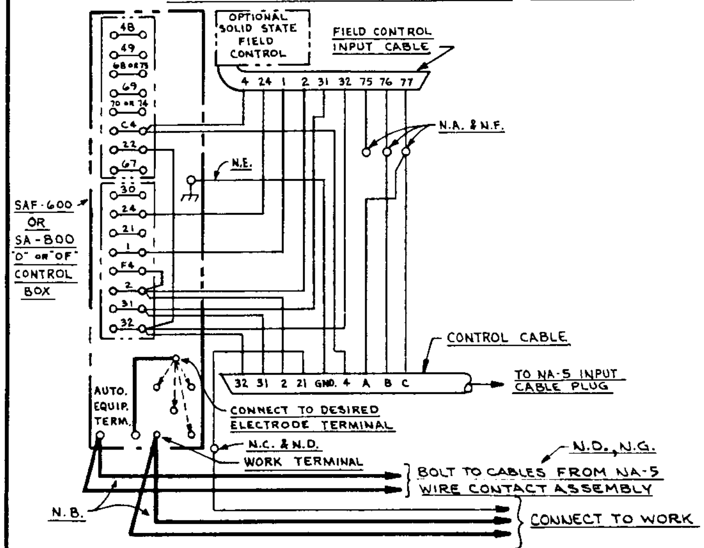
M13968
9-17-82B

Sec. T2.3.4-B

Connection of NA-5 (All) to a SAF-600 or SA-800, Types "-O" or "-OF" and M.G. Solid-State Field Control (Obsolete)

M-13984

CONNECTIONS MUST BE MADE EXACTLY AS SHOWN BELOW.
FOR ANY OTHER USE OF POWER SOURCE, DISCONNECT ALL NA-5 LEADS AND CABLES.



SAF-600 or SA-800 POWER SOURCE SETTINGS	NA-5 SETTINGS
TURN POWER SOURCE OFF. Set the Electrode Polarity switch for the desired polarity. Set the Voltage Control to maximum for higher voltage applications (above 25 volts), and to mid-range for low voltage applications. For Sub Arc: 1. Set the Voltage Range switch to High. 2. Connect the cable from the contactor box to the appropriate Sub Arc tap for the current being used. For all Open Arc Processes: 1. Set the Voltage Range switch to Low. 2. Connect the cable from the contactor box to the Innershield tap.	For Sub Arc: 1. Red lead on Voltage P.C. Board is connected to Pin "S". 2. White lead on Voltage P.C. Board is connected to Pin "A". For all Open Arc Processes: 1. Red lead on Voltage P.C. Board is connected to Pin "F". 2. White lead on Voltage P.C. Board is connected to Pin "A".

IMPORTANT WHEN CHANGING POLARITY: Turn generator off and allow it to come to a complete stop before changing polarity. The polarity switch on the Solid-State Remote Field Control and the polarity switch on the power source must be set to the same polarity. Failure to do so, will result in blowing the fuse in the Solid-State Field Control - and loss of generator output. Refer to NA-5 operating manual for required NA-5 control box polarity connections.

N.A. Bolt and tape connections separately. Tape up lead #75 from field control.

N.B. Welding cables must be of proper capacity for the current and duty cycle of immediate and future applications.

N.C. Extend lead #21 using #14 or larger insulated wire physically suitable for the installation. An S-16586-[ ] remote voltage-sensing work lead is available for this purpose. Connect it directly to the work piece, keeping it separate from the welding work cable connection to the work piece. For convenience, this extended #21 lead should be taped along the welding work cable.

N.D. Tape up bolted connection.

N.E. Connect the NA-5 control cable grounding lead to the frame terminal marked ⏚, near the power source terminal strip. The power source must be properly grounded.

FOR ADDITIONAL INSTALLATION INSTRUCTIONS, SEE NA-5 OPERATING MANUAL

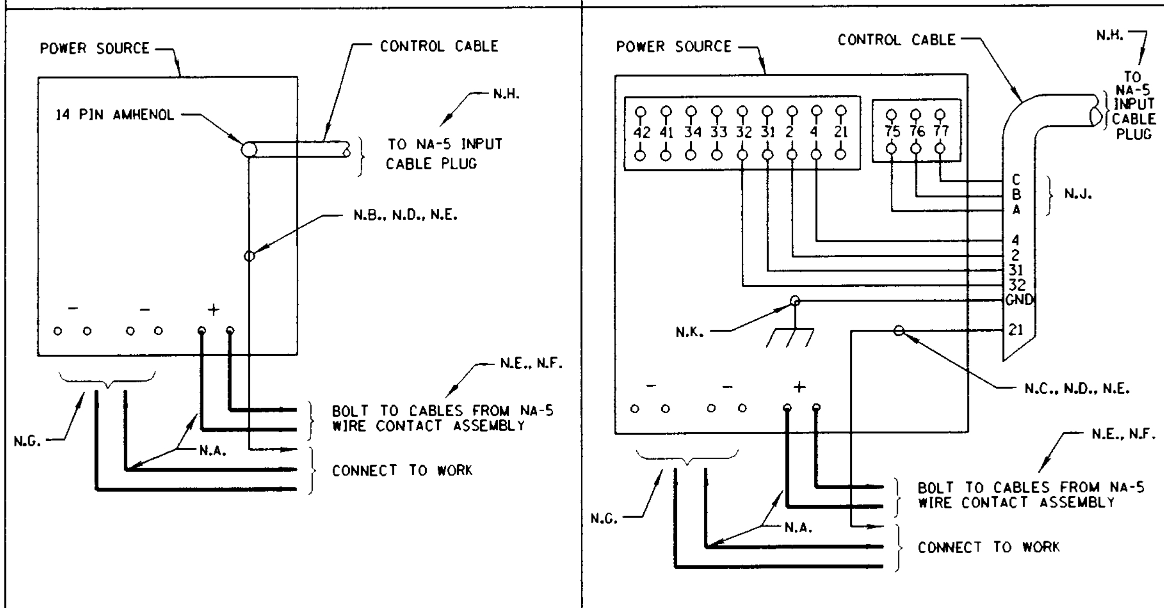
N.F. If using an older K-215 control cable: Connect lead #76 to Lead #76 of Field Control, connect leads #75 and #77 to lead #77 of Field Control.

N.G. For proper NA-5 operation, the electrode cables must be snugged under the clamp bar on the left side of the NA-5 Control Box.

Sec. T2.3.4-B-1

Connection of NA-5 (All) to a DC-650 With No Line voltage Compensator (Obsolete)

CONNECTION DIAGRAM DC-650 PRO/DC-750 TO NA-5 & NA-5R



DC650 PRO POWER SOURCE SETTINGS

1. TURN OFF INPUT POWER.
2. CONNECT ELECTRODE CABLES TO TERMINALS OF DESIRED POLARITY.
3. SET TOGGLE SWITCH TO SAME POLARITY AS ELECTRODE CABLE CONNECTION.
4. SET TOGGLE SWITCH TO REMOTE.

6. SET MODE SWITCH TO DESIRED POSITION FOR THE PROCESS TO BE USED.
7. CONNECT NEGATIVE OUTPUT CABLES TO MATCH MODE SWITCH SETTING.

NOTE: ABOVE DIAGRAMS SHOW ELECTRODE CONNECTED POSITIVE. TO CHANGE POLARITY, TURN POWER OFF, REVERSE THE ELECTRODE AND WORK CABLES AT THE POWER SOURCE AND POSITION THE SWITCH ON THE POWER SOURCE TO PROPER POLARITY. REFER TO NA-5 OPERATING MANUAL FOR REQUIRED NA-5 CONTROL BOX POLARITY CONNECTIONS.

N.A. WELDING CABLES MUST BE SIZED FOR CURRENT AND DUTY CYLE OF APPLICATION.
N.B. EXTEND LEAD #21A BY REMOVING LEAD #21A FROM THE TERMINAL STRIP AND CONNECTING IT TO A #14 OR LARGER INSULATED WIRE PHYSICALLY SUITABLE FOR THE INSTALLATION.
N.C. EXTEND LEAD #21 USING A #14 OR LARGER INSULATED WIRE PHYSICALLY SUITABLE FOR INSTALLATION.
N.D. CONNECT EXTENDED LEAD DIRECTLY TO THE WORK PIECE KEEPING IT SEPARATE FROM THE WELDING WORK CABLE CONNECTION TO THE WORK PIECE. FOR CONVENIENCE, THIS EXTENDED LEAD SHOULD BE TAPED ALONG THE WELDING WORK CABLE.
N.E. TAPE UP CONNECTION.
N.F. FOR PROPER NA-5 OPERATION, THE ELECTRODE CABLES MUST BE SNUGGED UNDER THE CLAMP BAR ON THE LEFT SIDE OF THE NA-5 CONTROL BOX.
N.G. CONNECT NEGATIVE OUPUT CABLES TO STUDS TO MATCH DC650 PRO MODE SWITCH SETTING.
N.H. THE JUMPERS ON THE NA-5 VOLTAGE BOARD MUST BE CONNECTED AS FOLLOWS: CONNECT RED JUMPER TO PIN 'S'
CONNECT WHITE JUMPER TO PIN 'B'.
N.J. IF USING AN OLDER K-215 CONTROL CABLE: CONNECT LEAD #75 TO #75 ON TERMINAL STRIP, CONECT LEAD #76 TO #76 ON THE TERMINAL STRIP, CONNECT LEAD #77 TO #77 ON THE TERMINAL STRIP.
N.K. CONNECT THE NA-5 CONTROL CABLE GROUNDING LEAD TO THE FRAME TERMINAL MARKED ⏚ NEAR THE POWER SOURCE TERMINAL STRIP.

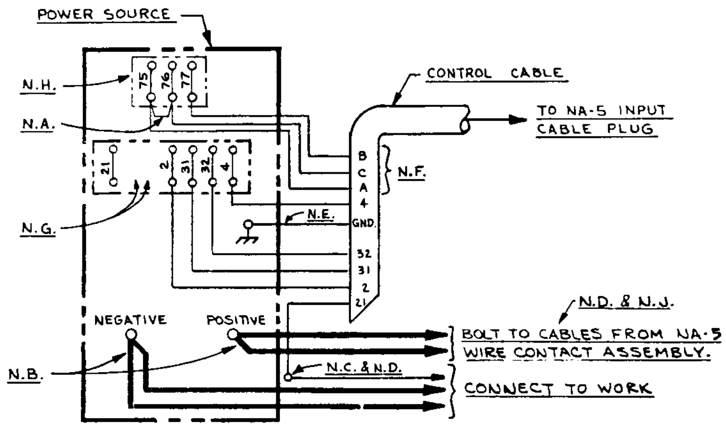
16 JUNE 92

Sec. T2.3.4-C

Connection of NA-5 (All) to R3S-400, -600 or -800 With No Line voltage Compensator (Obsolete)

M-13985

CONNECTIONS MUST BE MADE EXACTLY AS SHOW BELOW.
FOR ANY OTHER USE OF POWER SOURCE, DISCONNECT ALL NA-5 LEADS AND CABLES.



R3S POWER SOURCE SETTINGS	NA-5 SETTINGS
TURN POWER SOURCE OFF. For all processes: 1. Connect electrode cable to terminal of desired polarity. 2. Set the Polarity Switch to the same polarity as the electrode cable connection. 3. Set toggle switch to Remote. 4. Install voltage triangle in a position as close as possible to the desired arc voltage.	For Sub Arc: 1. Red lead on Voltage P.C. Board is connected to Pin "S". 2. White lead on Voltage P.C. Board is connected to Pin "A". For all Open Arc Processes: 1. Red lead on Voltage P.C. Board is connected to Pin "F". 2. White lead on Voltage P.C. Board is connected to Pin "A".

NOTE: Above diagram shows electrode connected positive. To change polarity, turn power off, reverse the electrode and work cables at the power source and position the switch on power source to proper polarity. Refer to NA-5 operating manual for required NA-5 control box polarity connections.

N.A. Add jumper from #75 to #76, using insulated copper wire.

N.B. Welding cables must be of proper capacity for the current and duty cycle of immediate and future applications.

N.C. Extend lead #21 using #14 or larger insulated wire physically suitable for the installation. An S-16586-[ ] remote voltage-sensing work lead is available for this purpose. Connect it directly to the work piece, keeping it separate from the welding work cable connection to the work piece. For convenience this extended #21 lead should be taped along the welding work cable.

N.D. Tape up bolted connection.

N.E. Connect the NA-5 control cable grounding lead to the frame terminal marked ⏚, near the power source terminal strip. The power source must be properly grounded.

FOR ADDITIONAL INSTALLATION INSTRUCTIONS, SEE NA-5 OPERATING MANUAL

N.F. If using an older K-215 control cable: Connect lead #75 to #75 on terminal strip, connect lead #76 to #77 on terminal strip, connect lead #77 to #76 on terminal strip, and add jumper per N.A.

N.G. On earlier R3S machines, #67 and #1 terminals were also on the terminal strip.

N.H. The upper terminal strip (#75, #76, #77) was not present on early R3S machines. Those machines are not compatible with the NA-5, since there can be no adjustment of voltage by the NA-5.

N.J. For proper NA-5 operation, the electrode cables must be snugged under the clamp bar on the left side of the NA-5 Control Box.

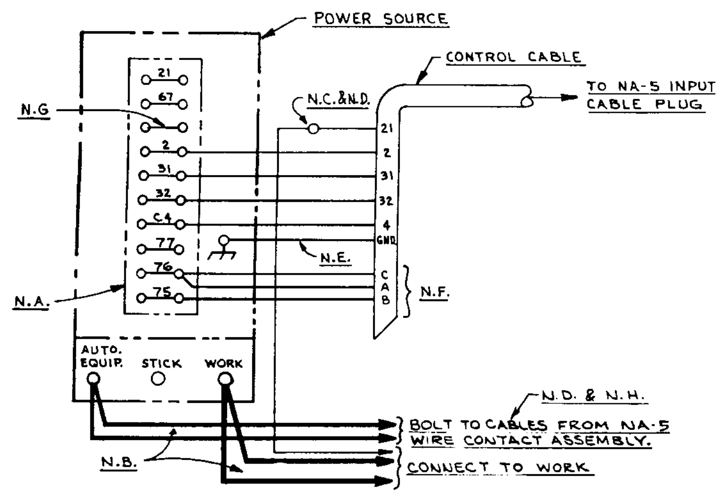
M13985
9-17-82B

Sec. T2.3.4-D

Connection of NA-5 (All) to a SAM-400 Motor Generator or Engine Welder

M-13986

CONNECTIONS MUST BE MADE EXACTLY AS SHOWN BELOW.
FOR ANY OTHER USE OF POWER SOURCE, DISCONNECT ALL NA-5 LEADS AND CABLES



NOTE: To change polarity, turn power off, and position the switch on power source to proper polarity. Refer to NA-5 operating manual for required NA-5 Control Box polarity connections.

N.A. Remove SAM Portable Field Control and connect NA-5 Control Cable.

N.B. Welding cables must be of proper capacity for the current and duty cycle of immediate and future applications.

N.C. Extend lead #21 using #14 or larger insulated wire physically suitable for the installation. An S-16586-[ ] remote voltage-sensing work lead is available for this purpose. Connect it directly to the work piece, keeping it separate from the welding work cable connection to work piece. For convenience, this extended #21 lead should be taped along the welding work cable.

N.D. Tape up bolted connection.

N.E. Connect the NA-5 control cable grounding lead to the frame terminal marked ⏚, near the power source terminal strip. The power source must be properly grounded.

N.F. If using an older K-215 control cable: Connect lead #76 to #75 on terminal strip, connect leads #75 and #77 to #76 on terminal strip.

N.G. On earlier SAM machines, #1 terminal was also on the terminal strip.

N.H. For proper NA-5 operation, the electrode cables must be snugged under the clamp bar on the left side of the NA-5 control box.

SAM POWER SOURCE SETTINGS

TURN POWER SOURCE OFF.

For Sub Arc:

1. Set the Electrode Polarity Switch to the Variable Voltage position of the polarity desired for the process being used.
2. Set the toggle switch to Constant Voltage.
3. Set the Constant Voltage Control to Number 7 and the Current Control to 500.

For all Open Arc Processes:

1. Set the Electrode Polarity Switch to the Constant Voltage position of the polarity desired for the process being used.
2. Set the toggle switch to Constant Voltage.
3. Set the Constant Voltage Control to Number 5.

NA-5 SETTINGS

For Sub Arc:

1. Red lead on Voltage P.C. Board is connected to Pin "S".
2. White lead on Voltage P.C. Board is connected to Pin "A".

For all Open Arc Processes:

1. Red lead on Voltage P.C. Board is connected to Pin "F".
2. White lead on Voltage P.C. Board is connected to Pin "A".

FOR ADDITIONAL INSTALLATION INSTRUCTIONS, SEE NA-5 OPERATING MANUAL

M13986
9-17-82B

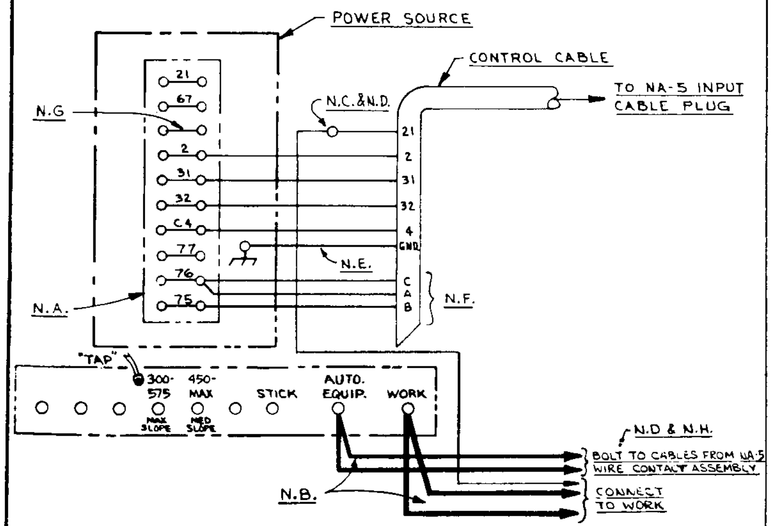
Sec. T2.3.4-E

Connection of NA-5 (All) to a SAM-650 Engine Welder

M 13987

CONNECTIONS MUST BE MADE EXACTLY AS SHOWN BELOW.

FOR ANY OTHER USE OF POWER SOURCE, DISCONNECT ALL NA-5 LEADS AND CABLES



NOTE: To change polarity, turn power off, and position the switch on power source to proper polarity. Refer to NA-5 operating manual for required NA-5 Control Box polarity connections.

N.A. Remove SAM Portable Field Control and connect NA-5 Control Cable.

N.B. Welding cables must be of proper capacity for the current and duty cycle of immediate and future applications.

N.C. Extend lead #21 using #14 or larger insulated wire physically suitable for the installation. An S-16586-[ ] remote voltage-sensing work lead is available for this purpose. Connect it directly to the work piece, keeping it separate from the welding work cable connection to the work piece. For convenience, this extended #21 lead should be taped along the welding work cable.

N.D. Tape up bolted connection.

N.E. Connect the NA-5 control cable grounding lead to the frame terminal marked ⏚, near the power source terminal strip. The power source must be properly grounded.

N.F. If using an older K-215 control cable: Connect lead #76 to #75 on terminal strip, connect leads #75 and #77 to #76 on terminal strip.

N.G. On earlier SAM machines, #1 terminal was also on the terminal strip.

N.H. For proper NA-5 operation, the electrode cables must be snugged under the clamp bar on the left side of the NA-5 control box.

SAM POWER SOURCE SETTINGS

TURN POWER SOURCE OFF.

For Sub Arc:

1. Set the Electrode Polarity Switch to the polarity desired for the process being used.
2. Set the toggle switch to Constant Voltage.
3. Set the Constant Voltage Control to Number 7.
4. Connect the TAP cable to the "300-575, Max. Slope" stud.

For all Open Arc Processes:

1. Set the Electrode Polarity Switch to the polarity desired for the process being used.
2. Set the toggle switch to Constant Voltage.
3. Set the Constant Voltage Control to Number 5.
4. Connect the TAP cable to the "450-Max, Med Slope" stud.

NA-5 SETTINGS

For Sub Arc:

1. Red lead on Voltage P.C. Board is connected to Pin "S".
2. White lead on Voltage P.C. Board is connected to Pin "A".

For all Open Arc Processes:

1. Red lead on Voltage P.C. Board is connected to Pin "F".
2. White lead on Voltage P.C. Board is connected to Pin "A".

FOR ADDITIONAL INSTALLATION INSTRUCTIONS, SEE NA-5 OPERATING MANUAL

Sec. T2.3.4-F

Connection of NA-5 (All) to a DC-1000 or DC-1500

S-16889

The diagram shows electrode connected positive. To change polarity, turn power off, reverse the electrode and work leads at the power source, position the positive-negative switch on the power source to correspond to the polarity of the electrode cable connection. Refer to NA-5 Operating Manual for required NA-5 control box polarity connections.

N.A. Welding cables must be of proper capacity for the current and duty cycle of immediate and future applications.

N.B. Extend lead 21 using #14 or larger insulated wire physically suitable for the installation. An S-16586-[] remote voltage sensing work lead is available for this purpose. Connect it directly to the work piece keeping it separate from the welding work cable connection to work piece. For convenience, this extended #21 lead should be taped along the welding work cable.

N.C. Tape up bolted connection.

N.D. Connect the NA-5 control cable gound lead to the frame terminal marked ⏚ near the power source terminal strip. The power source must be properly grounded.

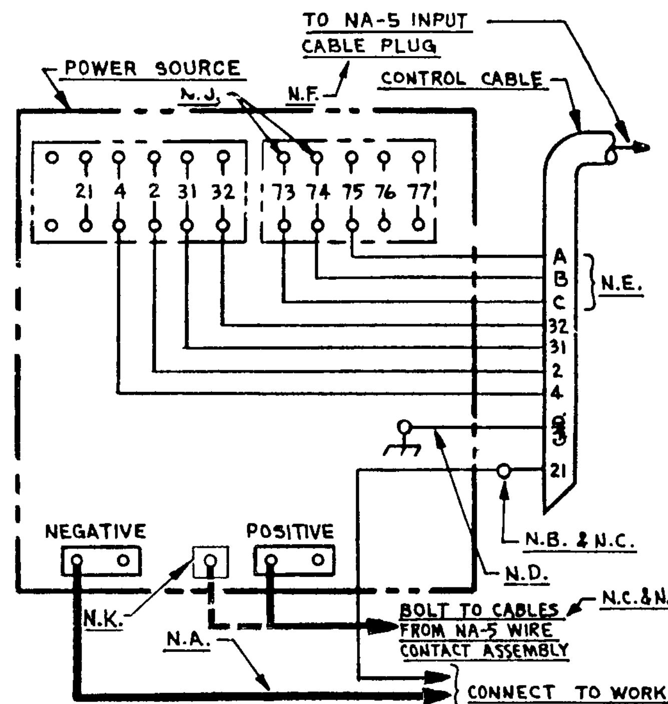
N.E. If using an older automatic control cable with leads 75, 76, 77: Connect lead 75 to #75 on terminal strip, connect lead #76 to #74 on terminal strip, connect lead #77 to #73 on terminal strip.

N.F. Connect the jumpers on the NA-5 voltage board as follows: Connect RED jumper to pin "S", Connect WHITE jumper to pin "B".

N.G. Set the DC-1000 or DC-1500 controls as follows:
Set the control switch to "Output Control Remote". For Submerged Arc Processes, set the mode switch to "C.V. Submerged Arc". For Open Arc Processes, set the mode switch to "C.V. Innershield".

N.H. For proper operation, the electrode cable must be snugged under the clamp bar on the left side of the NA-5 control box.

N.J. Terminals #73 and #74 were not present on DC-1500 machines below Code 8294. These earlier code machines are not suitable for use with the NA-5.



N.K. ALTERNATIVE 500 AMP POSITIVE TERMINAL CONNECTION PROVIDED ON DC-1000 MODELS ABOVE CODE 9500 ONLY.

N.L. Alternate submerged arc mode available for improved arc stability in high current, large puddle, slow travel procedures by making special connections on both DC-1500 and NA-5.

On DC-1500 Control Board (G-1530-2 and superseding) remove red and blue jumpers from "FR" pins and reconnect to corresponding "SR" pins.

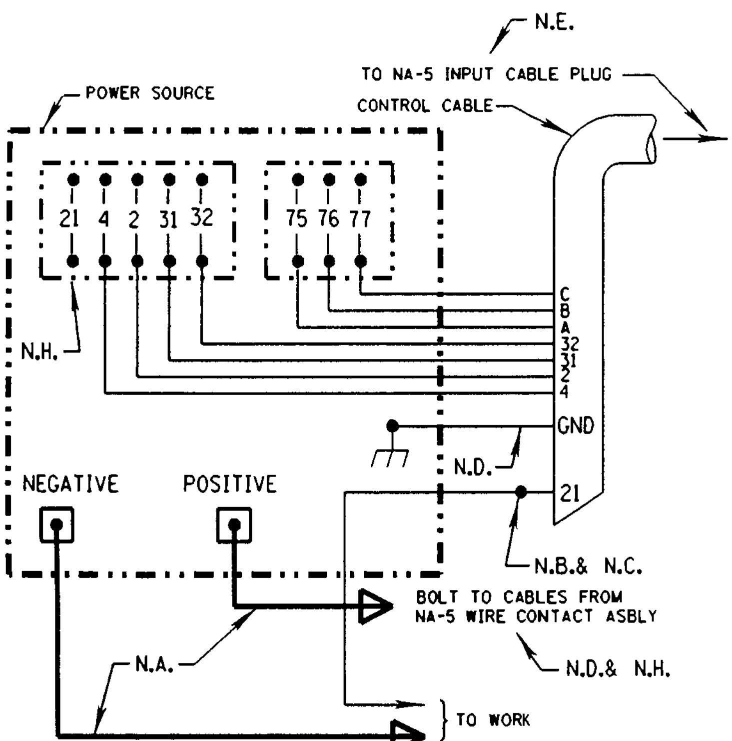
On NA-5 Voltage Board (G-1556-1 and superseding) white jumper must be connected to pin "D".

NA-5 pin "D" connection may also be used for some procedures on DC-1500 without control board jumpers, DC-1500 with control board jumpers on "FR" pins or DC-1000.

Sec. T2.3.4-G

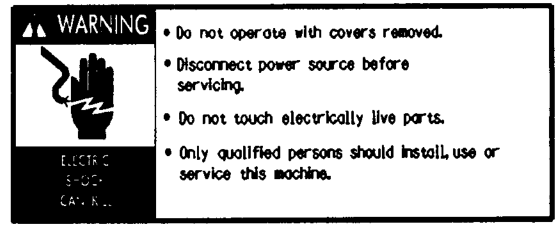
Connection of NA5 to DC400 or CV400

S17375



Above diagram shows electrode connected positive. To change polarity, turn power off, reverse the electrode and work leads at the power source and position the switch on power source (if equipped), to proper polarity. Refer to NA-5 Operating Manual for required NA-5 control box polarity connections. Also refer to note N.H.

FOR ADDITIONAL INSTALLATION INSTRUCTIONS, SEE NA-5 OPERATING MANUAL.



N.A. Welding cables must be of proper capacity for the current and duty cycle of immediate and future applications.

N.B. Extend lead #21 using #14 AWG or larger insulated wire physically suitable for the installation. An S16586-[LENGTH] remote voltage sensing work lead is available for this purpose. Connect it directly to the work piece keeping it electrically separate from the welding work lead circuit and connection. For convenience, this extended #21 lead should be taped to the welding work lead. (If the length of work lead circuit is short, and connections can be expected to be reliable, then control cable lead #21 does not need to be extended and can be directly connected to terminal #21 on the terminal strip. Note that this is not the preferred connection because it adds error to the NA-5 voltmeter reading.)

N.C. Tape up bolted connection.

N.D. Connect the control cable ground lead to the frame terminal marked ⏚ near the power source terminal strip. The power source grounding terminal (marked ⏚ and located near the power source input power connections) must be properly connected to electrical ground per the power source operating manual.

N.E. The jumpers on the NA-5 voltage board must be connected as follows: Connect red jumper to pin 'S'.
Connect white jumper to pin 'B'.

When using NA-5 controls above Code 8300 without the optional DC-400 diode kit or CV-400, CVI-500 diode option:
The NA-5 Inch Down button will not operate unless a jumper is connected between the two tab terminals, labeled 'AUTO', located above the transformer on the NA-5 Voltage P.C. board. This jumper, however, will disable the Cold Starting/Auto-Stop feature of the NA-5, permitting only Hot Starting techniques to be used.

N.G. For proper NA-5 operation, the electrode cables must be snugged under the clamp bar on the left side of the NA-5 control box.

N.H.* If lead #21 is to be connected to the terminal strip, connect to the #21 terminal that matches work polarity. This connection must be changed whenever the electrode polarity is changed.

* Does not apply to DC-400 below code 9200 with polarity switch.

S17375
1-20-89A

SEC. T2.5 – OPTIONAL FEATURE INSTALLATION

Sec. T2.5.3 (K129)
(File as Sec. L2.5.3 (K129) for IM-278)
(File as Sec. E2.7.5 (K129) for IM-245)

K129 Submerged Arc Small Wire Twinarc®

In "Twinarc" welding two small diameter (.045, 1/16, 5/64 or 3/32") solid wires are fed through a single wire feeder. Both wires must be the same size. Any standard NA-2, NA-2F, NA-3, NA-4 or NA-5 can be used. Gear ratio of the head must be 95:1. (The jumper on the NA-5 wire speed meter board must be in the proper position per Item E "Adjustments".)

The "Twinarc" assembly includes a wire reel, reel brake, shaft and mounting bracket, drive roll, idle roll assembly and the needed dual wire guides, nozzle and contact tip or contact tip holder. Spacing between the wires is fixed by the holes in the contact tip or contact tip holder.

A "Twinarc" assembly is available for each wire size — .045, 1/16, 5/64 and 3/32". Converting to a different wire size is accomplished by changing a few parts. See Parts List P-101-G.

An S17728 side-by-side tip holder is available for Lincore overlay welding procedures employing the same tips.

A. REEL INSTALLATION

1. See drawing on next page for mounting suggestions for the second electrode reel. The reel support bracket must be made by the fixture builder to fit the particular installation.

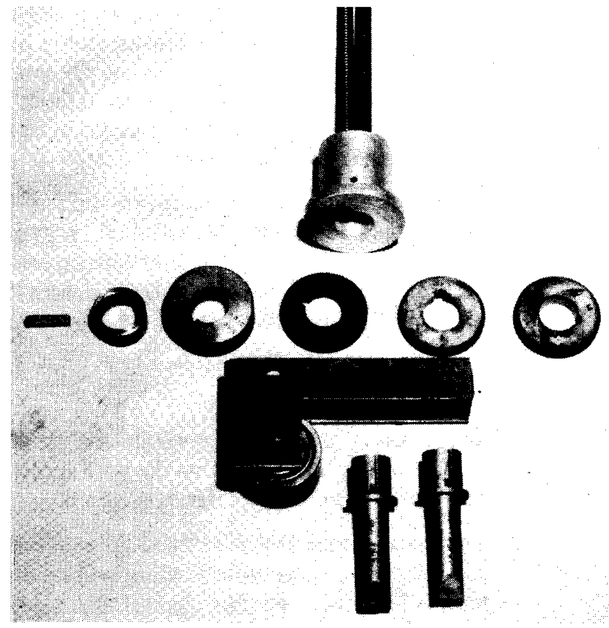
B. INITIAL PREPARATION (For .045, 1/16 or 5/64" wire)

1. Remove the following parts from the wire feed unit
   a. The wire straightener.
   b. The complete nozzle.
   c. Both the upper and lower guide tubes.
   d. The drive rolls.
   e. The idle roll assembly.[1]
2. Place the double grooved drive roll on the shaft and insert the key. Place the clamping washer back on the shaft and tighten the hex locking nut.

C. INITIAL PREPARATION (For 3/32" wire)

1. Remove the following parts from the wire feed unit.
   a. The wire straightener.
   b. The complete nozzle.
   c. Both the upper and lower guide tubes.
   d. The drive rolls.
   e. The idle roll assembly.[1]
   f. The drive roll key.
   g. The output shaft drive roll spacer.
2. Oil or grease the new, shorter drive roll spacer, place it on the output shaft and push it back as far as it will go.
3. Place the key in the keyway of the shaft.

[1] On later models, the shoulder bolt pivot replaced by a pin secured by a set screw located on the mounting surface of the face plate.



4. Place an outer, center and outer drive roll on the shaft and tighten the hex nut securely.

D. NOZZLE INSTALLATION

1. Place the new swivel type idle roll into position, tighten the pivot screw and then assemble the tension spring and screw.
   a. On the NA-2 and NA-2F, tighten the tension screw until the nut bottoms against the shoulder of the screw.
   b. On the NA-3, NA-4 or NA-5, with wire in the system, tighten the tension screw to the .045-3/32" position on the indicator plate.
2. Insert one of the guide tubes in the top hole of the face plate (use either one of the guide tubes supplied, both are identical). Place the dual ingoing wire guide over this guide tube. The two parts are keyed together so hole line up is automatic. Then place the two "L" shaped locking clamps (T8400) into position, line up the two flat surfaces of the guide tube so they are parallel with outside diameter of the drive and tighten the two locking screws.
3. Turn the nozzle upside down. Insert the two long wire guide tubes that were shipped loose into the nozzle body so they fit into the internal recessed holes in the mounting block. Place the contact tip (or the contact tip holder) into position at the end of the nozzle being sure the guide tubes fit into the recessed holes in the contact tip. Line up the holes in the contact tip or holder with the holes in the incoming end and lock it in position with the clamping nut.

Sec. T2.5.3 (K129), L2.5.3 and E2.7.5 (Continued)

4. Insert the other guide tube in the outgoing side of the face plate. Place the nozzle assembly over the guide tube. Here again the tube and the nozzle assembly are keyed to insure proper line up of the holes. Insert and tighten the two socket head screws and fasten the nozzle securely.

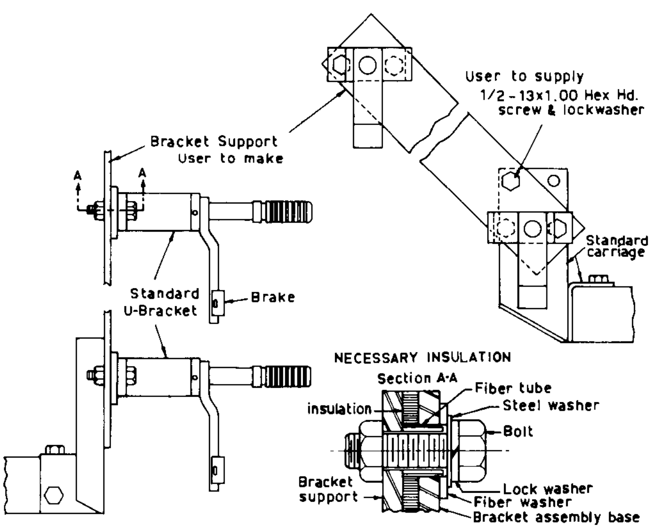
5. Fasten the electrode cables, one on top and one on the bottom of the electrode terminal, with a ½-13 nut and bolt. Use two 4/0 cables for currents up to 1000 amperes at 80% duty cycle. Use three 4/0 cables for 1000 – 1300 amperes, use four 4/0 cables for 1300 – 1500 amperes.

E. ADJUSTMENTS

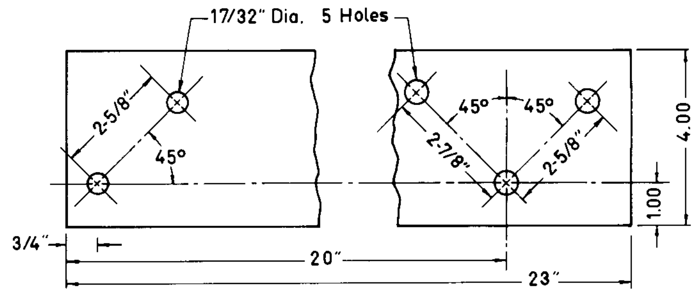
1. When using an NA-5, connect the calibration jumper lead to pin "95S" on the wire speed meter board per the table on the wiring diagram.

2. The ingoing tubes must be lined up with the drive roll grooves or poor wire feeding will be encountered. Therefore, do not change this adjustment once it is set.

3. There may be occasions where the two wires will be used other than in line with the seam to be welded. To adjust the nozzle for staggered or cross seam wire position, loosen the contact tip clamping nut. Rotate the nozzle tip until the desired wire position is set, then retighten the nut. Readjust the head position to get proper angle of wire to work.



METHOD FOR MOUNTING SECOND ELECTRODE REEL



BRACKET SUPPORT DETAIL
Materials - 3/8 x 4.00 x 23 H.R.S.

F. MAINTENANCE (For .045 wire)

Unscrew the locking collar and replace the contact tip when it no longer provides accurate wire placement or good electrical contact. Keep replacement tips in stock. For 1/16, 5/64 and 3/32" wire the tips can be replaced directly. Before installing the new tip or contact tip holder:

1. Make sure the threads and the bottom surface of the nozzle are clean and bright. These surfaces are current carrying areas and must be clean.

2. Check the locking ring threads making sure they are free of any foreign material. A small application of high temperature anti-sieze compound on the threads insures a longer life of the two mating parts. Suggested anti-sieze compounds are Graphite grease per Lincoln specification E-2067.

3. Inch electrode out of end of nozzle. If the long steel guide tubes came out with the old contact tip, slide the guide tubes over the wire. Then insert the wire through the holes in the new contact tip or contact tip holder. This procedure simplifies the assembly and line-up of the component parts.

4. Replace the locking ring and tighten securely.

Tip Holder Ceramic Replacement (1/16 thru 3/32" wire)

Should the ceramic inserts in the tip holder break, they may be replaced as follows:

- Remove nozzle tips
- Remove hollow-lok screws with a 5/32 Allen wrench
- Exchange broken ceramics with the new ones
- Screw hollow-lok screws in
- Replace nozzle tips

K225 SUBMERGED ARC TWINARC® KIT

Sec. T2.5.3 (K225)
(File as Sec.L2.5.3 (K225) for IM-278)

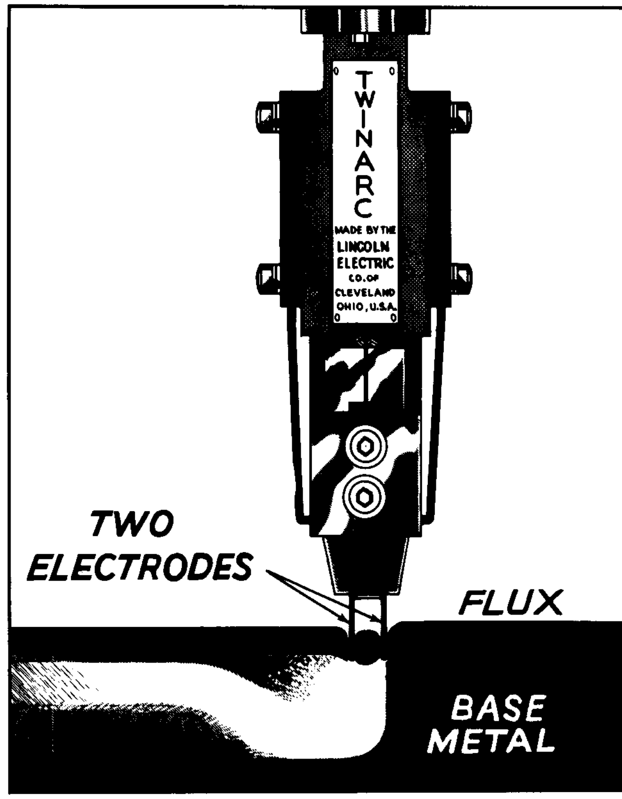
K225 Submerged Arc Twinarc® Kit

In "Twinarc" submerged arc welding, two (5/64, 3/32 or 1/8") solid wires are fed through a single wire feeder. Both wires must be the same size.

An NA-3S, NA-4 or NA-5 with a 142/1 gear ratio should be used. The 95/1 gear ratio may be required for maximum usable currents and wire feed speeds, especially with 5/64" electrode.

The "Twinarc" assembly includes a wire reel, insulated reel mounting bracket, drive rolls, drive roll locating collar, an idle roll assembly, wire straightener, dual wire guides, nozzle and contact block.

The contact assembly has two spring loaded jaws. These press the electrode against the center spacer block for good electrical contact to keep the nozzle cool and to maintain contact at a given point so electrical stickout remains constant during welding. Spacing between the wires is fixed by the size of the center contact block.



A. REEL INSTALLATION

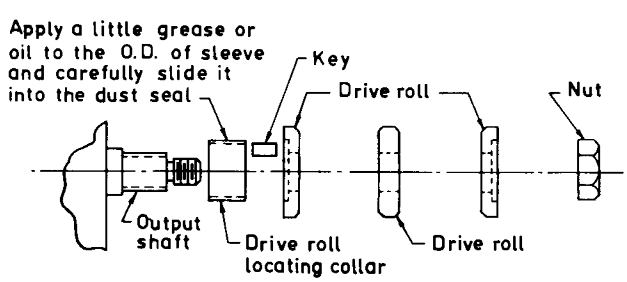
1. See drawing below for mounting suggestions for the second electrode reel. The reel support bracket must be made by the fixture builder to fit the particular installation. The wire reels should be located so the wire straightener knob points toward the wire reels.

B. INITIAL PREPARATION

1. Remove the following parts from the wire feed unit:
   a. The wire straightener.
   b. The complete nozzle.
   c. Both the upper and lower guide tubes.
   d. The drive roll assembly including the drive roll locating collar.
   e. The idle roll assembly. [See Sec. T2.5.3 (K129).]

C. 'TWINARC' ASSEMBLY (Parts listed on P-101-L)

1. Place the drive rolls on the shaft per the following sketch and tighten the hex locking nut.
2. Place the new swivel type idle roll assembly into position, tighten the pivot screw, and then assemble the tension spring and screw. Adjust the idle roll pressure adjustment screw for the wire diameter to be used while welding.



3. Insert one of the guide tubes into the top hole of the face plate (both guide tubes supplied are identical). Place the dual wire straightener over this guide tube. The two parts are keyed together so hole line up is automatic. Then place the two "L" shaped locking clamps into position, line up the two flat surfaces of the guide tube so that they are parallel with outside diameter of the drive roll, and tighten the two locking screws.
4. Fit the other electrode guide into the top of the 'Twinarc' nozzle. Install the nozzle to the head by first sliding the guide tube into the faceplate until the mounting screws supplied with the nozzle can be started into their respective tapped holes. Tighten these two screws. The lineup of the outgoing guide is automatic.
5. Fasten the electrode cables of the proper size to the copper bar on the nozzle. Use two 4/0 cables for currents up to 1,000 amps at 80% duty cycle. Split the cables so they will be on both sides of the copper bar.
6. Install the rubber flux tube provided onto the metal discharge tube at the bottom of the flux hopper. Slip the end of the rubber tube with the copper tip through the clip to the 'Twinarc' nozzle assembly.

Sec. T2.5.3 (K225) and L2.5.3 (Continued)

D. ADJUSTMENTS

Electrode Spacing: The wires are held against a center contact block by the two pressure springs on the jaws. The center block controls the distance between the wires. Center blocks for ⅜, ½, and ⅝ inch spacing are available.

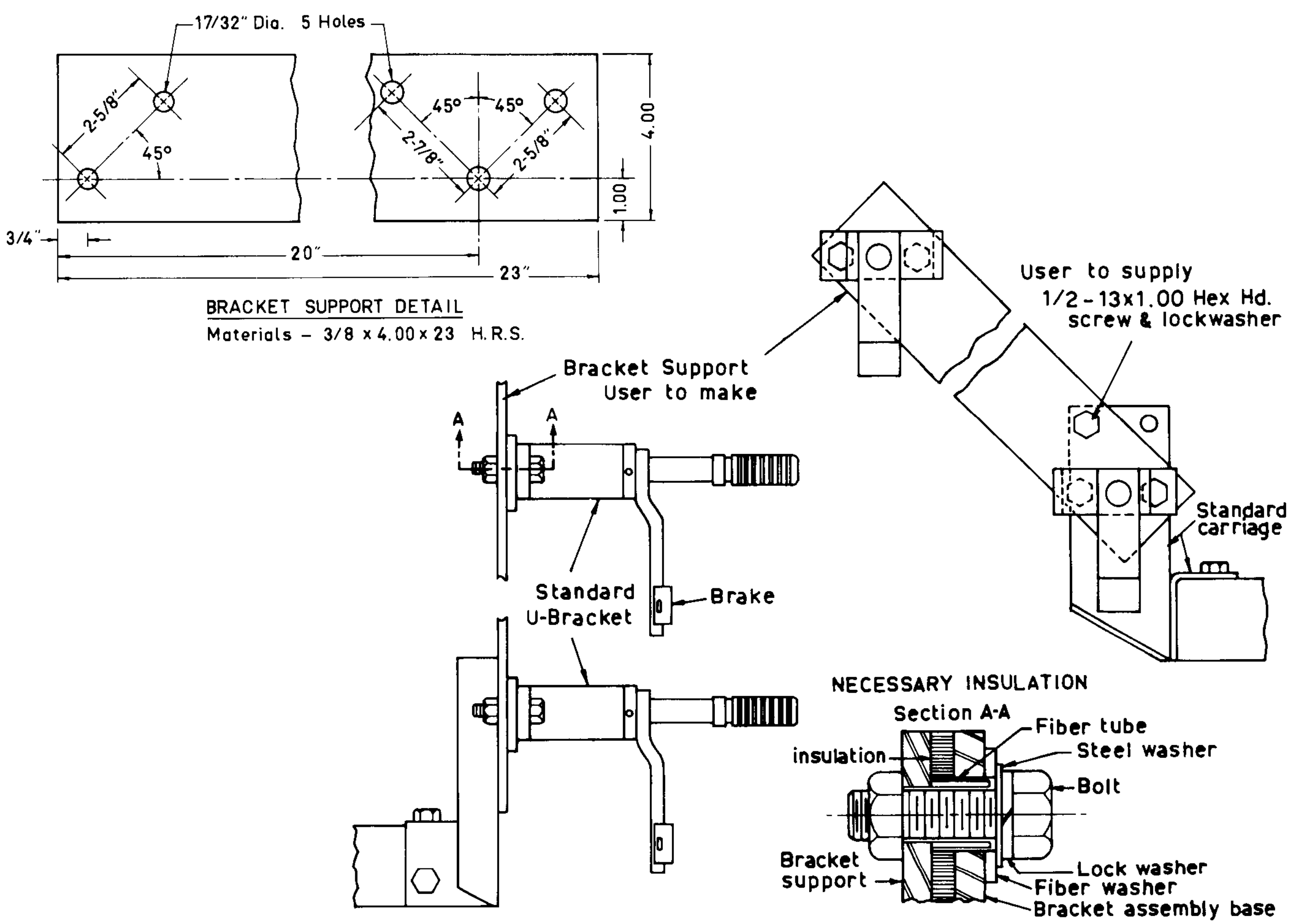
To change the blocks loosen the two pressure springs. Then remove the two ¼-20 socket head screws that hold the contact block. Before installing the new block, use graphite grease on the ¼-20 screw threads and be sure the mating surfaces between the center contact block and the mating surface on the copper current bar are bright, clean and flat. This junction carries the full welding current. After the contact block is in place and the two socket head screws are retightened, tighten the screws holding the pressure springs.

Nozzle Rotation: The nozzle can be set so the electrodes are in line with the joint for highest speed and penetration; straddle the joint for a wide bead and shallow penetration; or skewed across the joint for special conditions. To rotate the nozzle, loosen the two ¼-20 socket head screws that hold the body of the nozzle to the mounting base and rotate the nozzle to the desired angle. If the desired angle is not readily obtained, remove the socket head screws entirely and relocate them in alternate holes provided. Any desired angle can be obtained in this manner. Retighten the screws when properly adjusted.

E. MAINTENANCE

The greatest contact jaw wear takes place on the center contact block. The side pressure jaws are made from a special long wearing material. Replace the center contact block when it has such a groove worn that there is no pressure on the electrode from the side pressure jaws.

When replacing the center contact block, be certain the surface between it and the copper bar is bright, smooth and clean. This joint must carry up to 1,500 amperes.



METHOD FOR MOUNTING SECOND ELECTRODE REEL

K239 INNERSHIELD® TWINARC® KIT

Sec. T2.5.3 (K239)
(File as Sec. L2.5.3 (K239) for IM-278)
K239 Innershield® Twinarc® Kit

In Innershield 'Twinarc' welding, two 3/32″ flux-cored electrodes are fed through a single wire feeder. Both wires must be the same size. Any standard model of the NA-2, NA-3 or NA-5 with a 95/1 wire feed gear ratio can be converted for 'Twinarc' welding.

The K239 kit includes the nozzle equipped for water cooling, drive rolls, drive roll locating collar, idle roll assembly, ingoing and outgoing guide tubes, wire straightener, wire reel and wire reel mounting shaft and insulation. Spacing between the electrodes is fixed.

A. REEL INSTALLATION

1. See K129 for mounting suggestions for the second electrode reel. The reel support bracket must be made by the fixture builder to fit the particular installation.

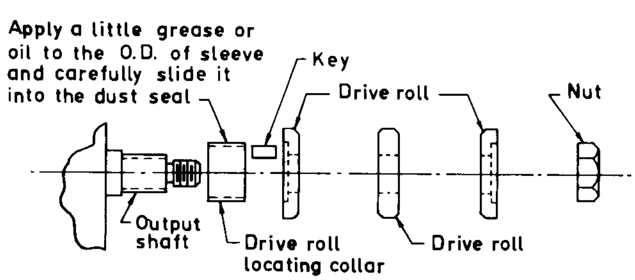
2. For optimum operation, the two wire reels should be mounted in the same plane as the drive rolls. The distance between the wire reels and the head should be far enough (3 to 4 ft.) to allow the Innershield electrode to orient itself before entering the wire straightener.

B. INITIAL PREPARATION

1. Remove the following items from the head. Save the parts so the head can be reconverted to single wire operation if required.
   a. The wire straightener assembly.
   b. Single wire nozzle assembly.
   c. Upper and lower wire guide tubes.
   d. The idle roll assembly. [See Sec. T2.5.3 (K129).]
   e. All the parts on the output shaft including the drive roll locating collar which is held on by a small set screw.

C. INSTALLATION (Refer to Parts List P-100-D)

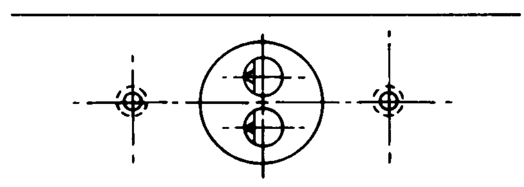
1. Install the new idle roll assembly and hold it in place with the pivot bolt, (Item 18) and nut (Item 17). Do not install the idle roll spring screw (Item 6) yet.
2. Install the drive rolls as shown.



3. (NA-3 or NA-5) Install the idle roll spring (Item 8), spring screw (Item 6), washer (Item 7) and yoke indicator assembly (Item 10). Tighten the idle roll spring screw to the .035-3/32″ setting on the yoke indicator assembly.

   (NA-2) Install the idle roll spring (Item 8) and spring screw (Item 6) with its washers and the square nut (Item 10). Tighten the spring screw until the nut hits the shoulder on the screw.

4. Insert one wire guide into the top of the faceplate (Item 1) and slip the wire straightener down over the top of it. The holes in the wire guide should be lined up squarely with the grooves in the drive roll as shown. Point the bent arm of the wire straightener either to the right or the left depending upon the location of the wire reels. When properly set, clamp straightener in position using the two L-shaped clamps (Item 5).



5. Fit the other electrode guide into the top of the 'Twinarc' nozzle. Install the nozzle to the head by first sliding the guide tube into the faceplate until the mounting screws supplied with the nozzle can be started into their respective tapped holes. Tighten these two screws. The lineup of the outgoing guide is automatic.

6. Fasten the electrode cables to the nozzle. Use two 4/0 cables for currents up to 1,000 amperes at 80% duty cycle. Place one on the top and one on the bottom of the electrode terminal and tighten the ½-13 bolt and the nut provided.

7. Water cooling is required for Innershield 'Twinarc' welding. Connect the tubes included on the nozzle to the water supply and drain using rubber tubing obtained locally. Water flow should be about 1/3 gallon of tap water per minute. Installation of a solenoid valve assembly (K223 for the NA-3 and NA-5; M10502 for the NA-2) is recommended to control cooling water flow. Installation instructions are included in the kits.

D. WATER FLOW SWITCH INSTALLATION

Installation of a switch which permits welding *only* when cooling water is flowing in the nozzle is highly recommended. The switch must operate at the 1/3 gallon per minute level.

1. **For the NA-5** — Install a K336 Remote Interface Module. Then connect a flow switch with normally closed contacts between the "Common Terminal" and the "Weld Stop Terminal" of the interface module. If water is not flowing, the weld cannot

Sec. T2.5.3 and L2.5.3 (Continued)

be started. The switch should be suitable for a low level voltage of 24 volts and 10 milliamps. Two suitable switches are as follows:

Delaval Gems Sensor Division Farmington, Connecticut 06302	Switch Number FS925 SPDT – N.C.
Hoban Engineering Corp. 1074 N.W. 1st Avenue Boca Raton, Florida 33432	Switch Number 200-B-2-A SPST – N.C.

2. **For the NA-3** – Use a switch with normally closed contacts. The two switches listed under the NA-5 are suitable.

   Connect the switch to terminals #528 and #582 on the NA-3 terminal strip. If welding starts (current flows) when no water is flowing, the NA-3 shuts down.

3. **For the NA-2** – Use a switch with normally open contacts. Two suitble switches are as follows:

McDonnell & Miller ITT 3500 N. Spaulding Avenue Chicago, Illinois 60618	Switch Number FS6 SPDT
Hays Manufacturing Co. Division of Zurn Industries Erie, Pennsylvania 16512	Switch Number 2600-0811 SPDT

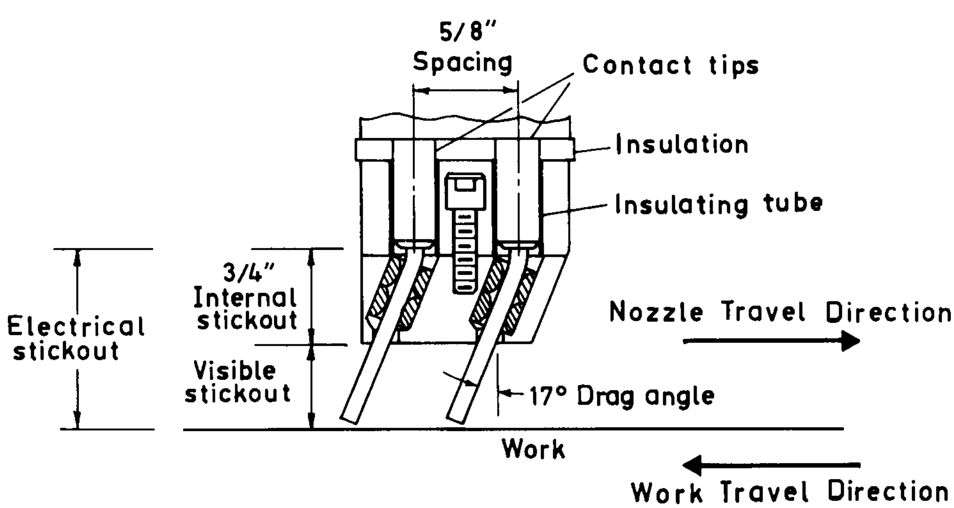
   Remove the jumper from 20 to 26 on the terminal strip in the NA-2 control box. Connect the normally open contacts of the switch to these terminals. The switch will prevent 1CR from pulling in if no water is flowing.

E. ADJUSTMENTS

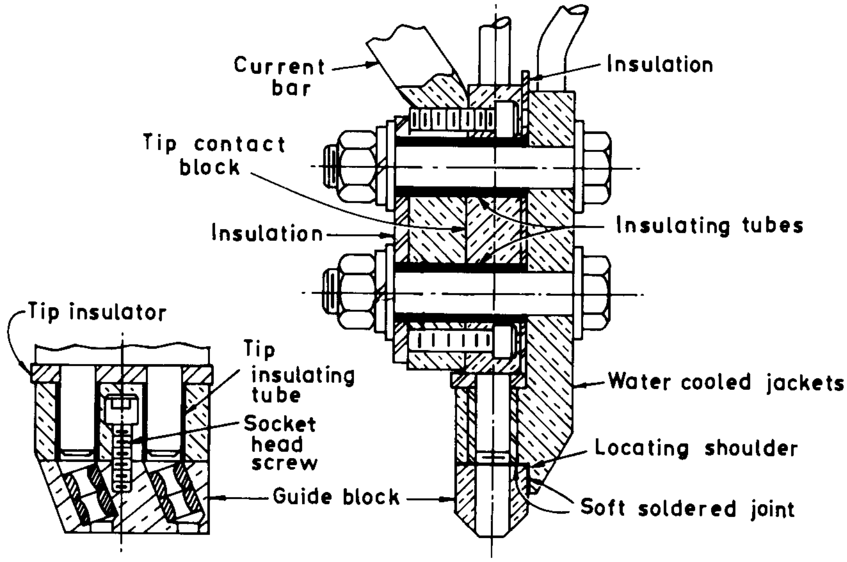
1. When using an NA-5, connect the calibration jumper lead to pin "95S" on the wire speed meter board per the table on the wiring diagram.
2. **Nozzle Rotation:** The proper lineup of the electrodes with the seam should be specified by the procedures. To rotate the nozzle, loosen the two ¼"-20 socket head screws which hold the body of the nozzle to the mounting base and rotate the nozzle to the desired angle. If a greater angle is required, remove the socket head screws entirely and relocate them in the alternate holes provided. Any desired angle can be obtained in this manner. Tighten the screws when properly adjusted.
3. **Electrode Spacing, Drag Angle and Electrode Stickout:** As shown in the following sketch, the electrode spacing, drag angle as the electrode leaves the guide block and the internal electrical stickout is fixed. The electrical stickout is ¾" greater than the visible stickout. Set the stickout as specified by the procedures.

F. LOADING THE ELECTRODE

1. Remove either the nozzle or the guide block at the end of the nozzle.
2. Load the wire reels with Innershield electrode per instructions in Sec. T3.2.2. For "Speed Feed" drums and reels see Sec. T2.5.7-A and B.
3. Remove the U-shaped ingoing guide from the top of the wire straightener. Turn the straightener adjusting knob for minimum straightening. Straighten the first 10" of electrode and insert the ends through their respective holes and down through the straightener and ingoing guides to the drive rolls. Press the 'Inch-Down' button until both wires start to feed through the rolls.
4. Turn the straightener knob away from minimum straightening and slide the U-shaped guide along the wires to its original position. Lock the thumb screw.
5. Inch the electrode through the drive rolls and adjust the straightener until the wire is straight. Mark this position so it can be quickly reset after the next loading of the reels. The straightener will do a good straightening job if the reels are properly installed as described under "Reel Installation".



Sec. T2.5.3 (K239) and L2.5.3 (Continued)



G. MAINTENANCE

1. Replace the contact tips when the output current and voltage become unstable. For access to the tips, remove the two screws holding the guide block assembly.

2. Holes worn in the guide block assembly allow the wire to wander. When replacing the assembly, it is absolutely essential to follow these replacement instructions:

   a. Shut the welding power source off.
   b. Shut water flow off.
   c. Disconnect water lines from the water cooled jacket.
   d. Remove the two hex head screws which mount the water cooled jacket to the tip contact block and current bar. Slide the jacket down off of the tips.
   e. With the use of a small propane torch, apply just enough heat to melt the soft joint between the guide block and the water jacket. *Do not* overheat (600°F max.).
   f. Remove the socket head screw while the joint is still hot, then remove the guide block.
   g. Remove the two tip insulating tubes from the two holes in the water cooled jacket.
   h. Re-tin the mating surfaces of the water cooled jacket using an acid core 50 – 50 solder. Avoid getting solder into the holes.
   i. The new guide block is tinned at the factory and only a light amount of sanding of the mating surfaces will be necessary.
   j. Assemble the guide block to the water jacket using the socket head screw removed previously.
   k. Make sure the guide block is back against the locating shoulder. Stand the unit up vertically with the guide block at the bottom, then heat the assembly again until the solder melts between the joints; tighten the screw during the time the solder is in a liquid state. Add a little solder to the mating edges to insure a good soldered joint. Do not overheat. Improper soldering will cause the joint to overheat and fail while welding.
   l. Allow piece to cool and insert new tip insulating tubes into the water cooled jacket.
   m. Reassemble the unit.

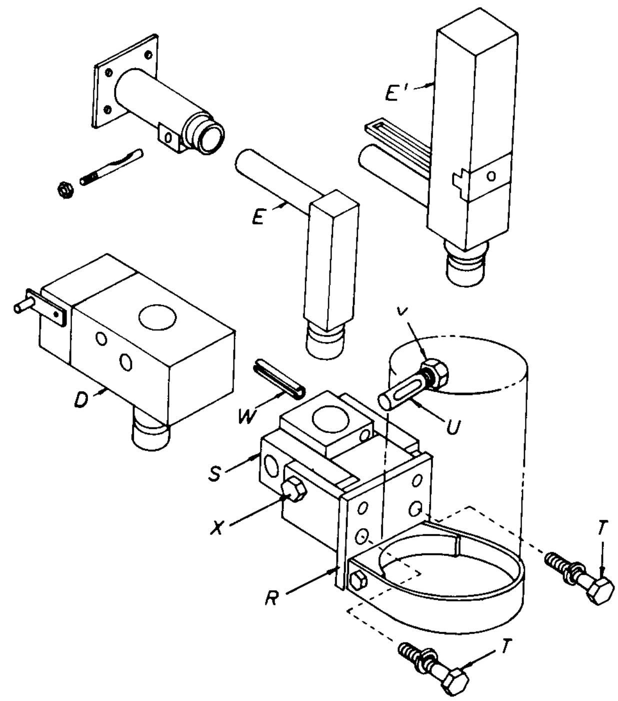
February 1982

K218 HORIZONTAL FILLET/LAP ATTACHMENT

Sec. T2.5.4
(File as Sec. L2.5.4 for IM-278)

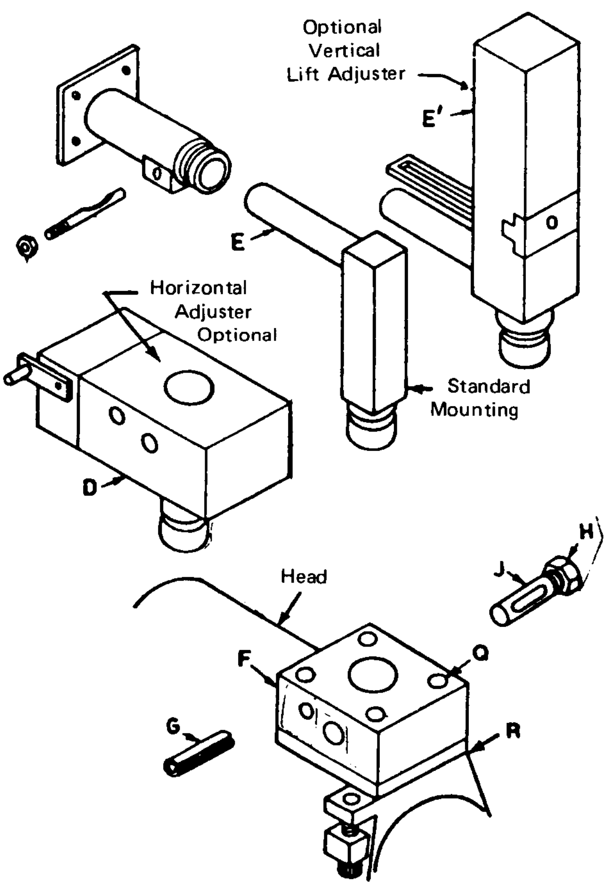
K218 Horizontal Fillet/Lap Attachment

This special contact assembly is recommended for submerged arc welding horizontal fillet and lap joints on 3⁄16″ and thicker plate. With the special head pivot assembly loose, the guide wheels ride in the joint for accurate bead placement, often eliminating the need for expensive fixtures and clamps.



INSTALLATION OF HEAD PIVOT ASSEMBLY

1. If already installed, remove the straight contact assembly from the head. Remove the electrode cables from the contact assembly.
2. Unplug the wire feed motor and flux hopper cords from the control box.
3. Remove the flux hopper. Be sure the draw bolt nut (H) is tight and remove the roll pin (G) from the head mounting block (F).
4. Support the head so it cannot fall, loosen the draw bolt nut (H) and lower the head from the mounting (E) [or optional horizontal adjuster (D) or vertical lift adjuster (E′)].



5. Remove the four Allen screws (Q) which hold the mounting block (F) to the gear box mounting plate (R). (Save items G, H, J, Q and F for reassembly if the K218 is to be removed.)
6. Attach the pivot assembly (S) included in the kit to the gear box mounting plate (R) using the two ½-13 hex head screws (T) and lockwashers included in the kit.
7. Put the draw bolt (U) shipped with the kit into the pivot assembly (S) with the cut in the bolt in proper position to allow the assembly to slide onto the head mounting.
8. With the wire feed motor vertical, slide the entire assembly onto the post of the head mounting (E) [or optional horizontal (D) or vertical lift adjuster (E′)] and tighten the nut (V). Drive the safety roll pin (W) shipped with the kit into the pivot assembly. This pin holds the head on the mounting but allows it to pivot about the axis of the mounting post when the nut (V) is loose.
9. Loosen the lock nut (V) and position the pivot shaft of the pivot assembly (S) parallel to the weld travel direction. Tighten the lock nut (V).

INSTALL THE CONTACT ASSEMBLY AND FLUX TUBE

1. Rotate the drive roll box to position the wire straightener on top.
2. Put the outgoing wire guide from the drive roll mechanism into the hole in the top of the fillet/lap attachment contact assembly. Place the contact assembly in position on the bottom of the drive roll box and tighten the two screws which hold it to the head.

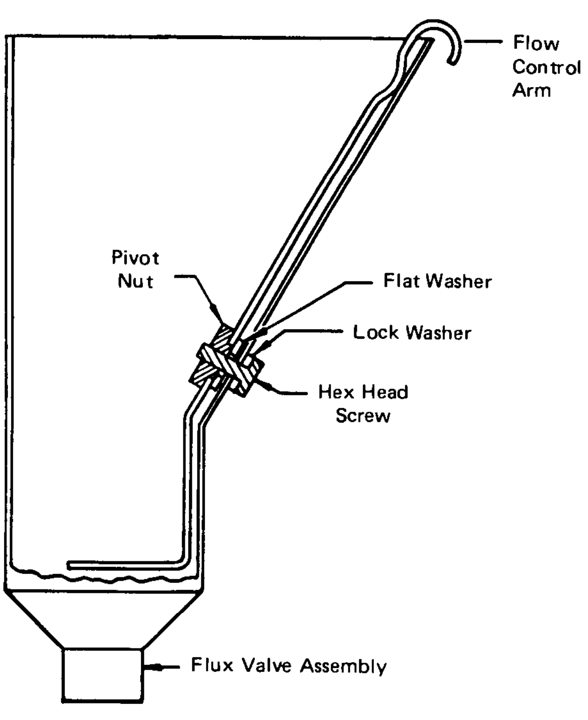
Sec. T2.5.4 and L2.5.4 (Continued)

3. Connect the electrode cable from the control box to the contact assembly. Place one cable on each side of the connection tab with the lugs flat against the tab and tighten the bolt and nut.
4. Install the flux hopper. (If adding a flux hopper kit to an NA-3N or NA-5N, install per instructions shipped with the kit.)
5. Attach the flux tube included in the kit to the flux hopper and tighten the wing screw.
6. Plug the wire feed motor and flux hopper cords into the appropriate receptacles on the side of the control box.

INSTALL THE FLUX CONTROL KIT (T-14861)

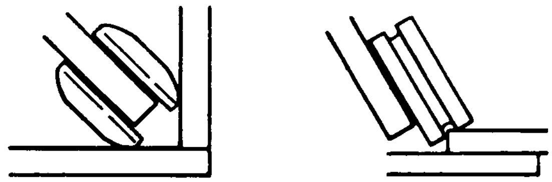
This kit includes a mechanical flux flow control arm which is installed as follows:

1. Remove the 3/8" hex head screw from the sloping surface of the flux hopper. Replace this screw with the longer screw and lockwasher included in the kit and tighten the screw.
2. Put the flat washer from the kit over the screw. Place the control arm inside the hopper with the bent section straddling the top edge of the hopper and the hole over the screw installed in paragraph 1.
3. Screw the special pivot nut from the kit onto the screw so the shoulder of the pivot area enters into the hole in the control arm. Tighten the nut against the flat washer. The arm must be free to rotate about the pivot nut.



OPERATION

1. If making lap welds on 3/16" thru 3/8" plate, install the grooved guide roll shipped with the kit. This guide roll is designed to ride along the top corner of the upper plate. Use the fillet guide roll for lap welds on plate over 3/8" thick.



2. If making fillet welds, install the double guide rolls which are designed to ride against both the vertical and horizontal members of the joint with sufficient clearance between the rolls to clear tack welds.
3. Obtain the proper position of the electrode with respect to the joint by adjusting the hex screw above either guide roll.
4. Adjust the flux hose to deposit flux directly onto the wire at the joint. Do not allow flux to fall ahead of the guide roll.
5. Loosen the lock screw (X) on the pivot assembly (S) allowing the head to swing freely about the pivot shaft.
6. The combination of the off-center weight of the head and the downward pressure of the spring on the contact assembly holds the guide rolls in contact with the joint. This system automatically compensates for misalignment between the work and the head up to 1/4" either vertically or horizontally.

MAINTENANCE

1. Periodically grease the contact assembly pivot point through the grease fitting on the assembly.
2. Rusty or dirty wire and excessively high currents increase jaw wear. When arcing occurs in the jaws or the wire becomes loose in the jaws, remove the jaws and dress them down by filing. When an excessive amount of material is worn off, replace the jaws. Contact jaws manufactured after April, 1979 have replaceable contact inserts (refer to P-101-N).

K281 SOLID WIRE STRAIGHTENER FOR TINY TWINARC®

Sec. T2.5.5
(File as Sec. L2.5.5 for IM-278)

The K281 Tiny Twinarc wire straightener will straighten .045 through 3/32" wire diameters. It is recommended for welding procedures requiring long stickout and where wire position accuracy is essential. The maximum recommended electrical stickouts are as follows:

Wire Size	When Using Standard K129 Spring Ingoing Guides	When Using Optional K281 Straightener
.045	3/8"	5/8"
.052	1/2"	3/4"
1/16	3/4"	1 1/4"
5/64	1"	1 3/4"
3/32	1 1/4"	2"

A. GENERAL INSTALLATION

1. For best wire straightening the plane of the straightener rolls should be as close as possible to the same plane as the wire reels.
2. The straightener moving arm should be pointing toward the reels and the adjusting knob should be away from the reels.
3. The wire straightener can be mounted in two positions and the NA-3, NA-4 or NA-5 head can usually be positioned to meet the requirements.

B. INSTALLATION PROCEDURE

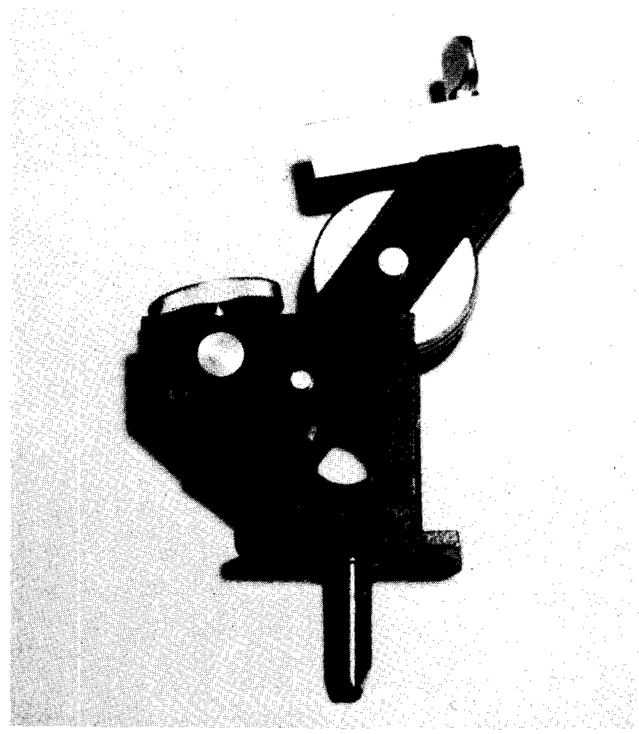
1. Remove ingoing spring wire guide.
2. Remove ingoing wire guide tube.
3. Insert the new ingoing wire guide tube (ceramic inserts).
4. Place the wire straightener over the guide, positioned as outlined in "A" above, and tighten the two hex head screws.

C. REELS AND SPEED FEED DRUMS

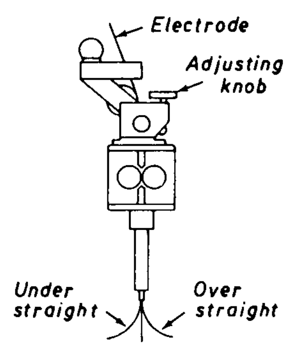
(See Sec. T2.5.7 for detailed instructions on wire feeding from Speed Feed Drums and Reels.)

D. WIRE LOADING AND STRAIGHTENER ADJUSTMENT

1. Turn the straightener knob to the maximum open position.
2. Remove the top ingoing guide block by loosening the thumb screw.
3. Straighten each coil end for a distance of approximately 10" – the straighter the wire the easier to load.
4. Insert one wire in each of the guide block holes.
5. Enter both wires down through and between the rollers, then through the upper wire guide tube until the wires touch the drive roll. Push the inch button and start the wires through the wire feeder.



6. Replace the upper ingoing guide block which is keyed with two roll pins. Make sure that each wire is in its respective groove in each of the rolls. Tighten the thumb screw.
7. Turn the adjusting knob until the moving arm is approximately in the mid position of its total movement.



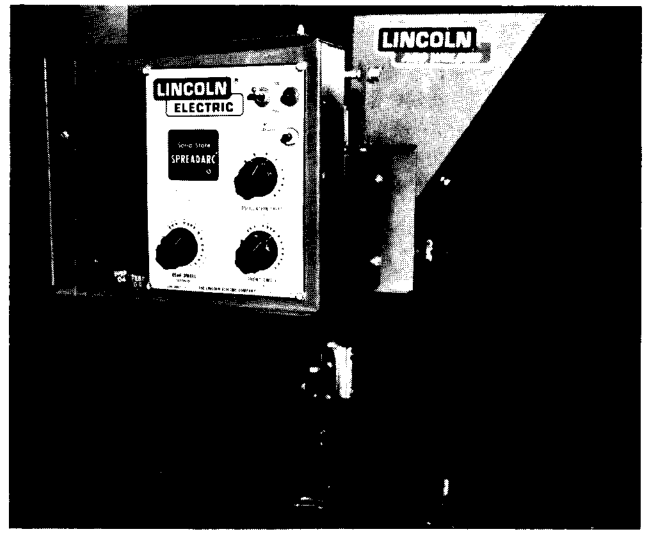
The tips should be in line with the O.D. of the drive roll for initial straightening adjustment. If the wires are bowing to the right, it is being over-straightened. If the wire is bowing to the left, then the wire is not being straightened enough. Adjust the knob until the wire comes out parallel and uniform. Depending on how the electrode enters the straightener, there may be some side bend to the electrode.

After the wire is coming out of the nozzle with satisfactory straightness, the tip orientation can be changed to whatever angle between "in line" or "cross seam" is required. This is accomplished by loosening the hexagon clamping nut and then rotating the tip or tip holder to whatever wire orientation is required.

February 1982

K278 SPREADARC™

Sec. T2.5.6
(File as Sec. L2.5.6 for IM-278)



A. GENERAL INFORMATION

The K278 Spreadarc oscillator has been designed for use with the NA-3N, NA-3S, NA-4, NA-5N or NA-5S head and control. The primary application for this accessory piece of equipment is for hardfacing buildup using a Twinarc® nozzle. The "Spreadarc-Twinarc" covers large areas quickly with smooth beads of minimum admixture with the base metal. Flux cored electrode, open arc and submerged arc procedures can be used.

The K278 Spreadarc produces a linear oscillation of the automatic head and nozzle. The advantages of the K278 Spreadarc are as follows:

1. The arc length remains constant during oscillation to give more uniform penetration.
2. There are controls for dwell periods at the end of the stroke to provide smoother bead edges.
3. The travel speed of the arc is uniform across the bead.

The control circuitry of the new Spreadarc uses solid-state electronics. The dwell time and oscillation speed controls are calibrated for easy setting. The length of the oscillation travel distance is easily adjustable from four inches to one-quarter inch by repositioning stops which activate sealed, snap action limit switches.

A control box containing the electrical controls is mounted on the side of the unit opposite the head mounting. The operating controls consist of:

1. "On-off" switch.
2. "On" pilot light.
3. Circuit breaker (protects control circuit and motor from short circuit conditions).
4. Oscillation speed. The nameplate dial is calibrated directly in "inches per minute".
5. Front and rear dwell controls. Each has the nameplate dial calibrated directly in seconds.

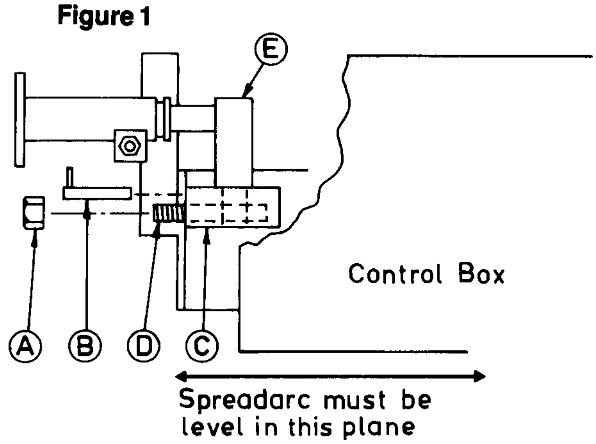
Specifications:

Input voltage – 115 volts, 50 or 60 hertz.
Input current – 1.0 ampere maximum.
Weight – 62 pounds (without head).
Maximum allowable additional weight to be mounted on Spreadarc – 70 pounds (one NA-3, NA-4 or NA-5 head with flux hopper.)
Oscillation track – 0.25 to 4.0 inches.
Oscillation speed – 10-120 in/min.
Dwell at either end of travel – .10 to 2 seconds.

B. INSTALLATION

1. The Spreadarc can be mounted on a K325 travel carriage or on a stationary head mount in which case the work must be moved. When the Twinarc process is used with the wire reels mounted on the carriage, the K325HC heavy duty carriage is recommended. In many applications it may be desirable to use the K29 vertical lift adjuster. **The Spreadarc cannot be used with a K96 horizontal head adjuster or with high frequency starting.**
2. Remove the hex nut (A) and the support pin (B) from the Spreadarc mounting block (C). With the draw bolt (D) properly in place, mount the Spreadarc to the head support or vertical lift (E). Maintain support until the support pin (B) is inserted into the mounting block (C), and install hex nut (A) on draw bolt (D). Rotate the Spreadarc until it is perpendicular to the travel carriage beam and tighten hex nut (A). Make certain that travel carriage beam or stationary mounting is properly squared up. The Spreadarc must be level in the horizontal plane within ±2° (see Figure 1).

Figure 1



3. Remove the head mounting block from the NA-3, NA-4 or NA-5 head by removing the four allen head cap screws. This part is not used. Mount the head to the Spreadarc using the two ½-13 × 1 hex head screws, washers and lockwashers supplied with the Spreadarc through the two large holes in the head mounting pad.

Sec. T2.5.6 and L2.5.6 (Continued)

NOTE: Before mounting an NA-5 head to the Spreadarc, to assure adequate clearance between the motor connection box and the Spreadarc head mounting surface, the motor mounting to the gearbox should be rotated per the instructions below.:

1. Remove the four screws mounting the gearbox assembly to the motor adapter plate, and remove the gearbox.
2. Remove the three screws mounting the adapter plate to the motor, rotate the adapter plate 90° clockwise, and replace the three mounting screws.
3. Remount the gearbox assembly with the four mounting screws.

The drive motor is to be in the vertical position and the drive rolls are to face the front. Loosen the head face plate clamp screw and rotate the face plate so that the idle roll arm is *down*. Install the nozzle, wire straightener and flux hopper (if used) per the NA-3, NA-4 or NA-5 operating manual (see Figure 2).

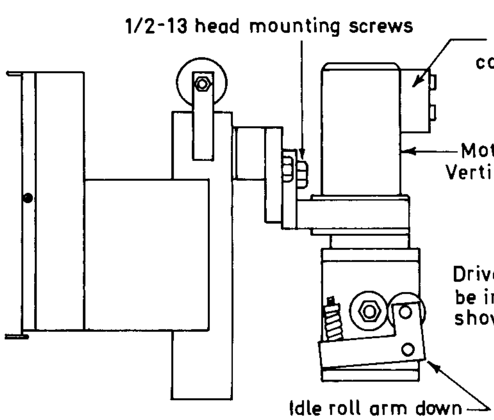


Figure 2

When using a K225 Twinarc nozzle, a K219 flux hopper and a standard head mounting on a travel carriage, and when welding from left to right, a special 12″ flux tube is required. The tube, which is included with the Spreadarc, may be trimmed in length to fit the installation. In addition, it is necessary to reposition the steel plate on the nozzle to which the flux hose retainer ring is attached. Remove the two screws holding this plate and rotate the plate 180° so the ring is closer to the bottom of the nozzle. Replace the screws.

Insert the three prong line cord plug into a 115 volt 60 or 50 hertz outlet. The Spreadarc unit is grounded through the line cord, but the head mounting is insulated from the Spreadarc carriage. **Do not allow any conducting element to bridge from the Spreadarc to the head since the head, including the motor and gear box case, is at welding potential.**

4. The Spreadarc can also be powered by an NA-3, NA-4 or NA-5 unit providing the welding power source supplying #31 and #32 has sufficient auxiliary power capacity. Instructions are as follows:

   a. Turn off the input power to the NA-3, NA-4 or NA-5 control box.
   b. Remove the three prong plug from the Spreadarc power cord and remove the rubber jacket 10 inches from the end of the cord.
   c. Install a terminal for a #10 screw on the green lead and terminals for #6 screws on the white and black leads.
   d. Install the power cord through the access hole in the left side of the control box using a strain relief cable clamp.
   e. Remove the nut from the grounding stud located on the same side as the access hole. Install the terminal of the green lead on the grounding stud, keeping the other terminals in place. Replace and securely tighten the nut on the grounding stud.
   f. Install the white lead on terminal 32 on the terminal strip.
   g. Install the black lead on terminal 31 on the terminal strip.

C. OPERATION

1. Set the oscillation speed control and the rear and front dwell controls as called for in the welding procedure. The front dwell control controls the dwell when the nozzle is farthest from the Spreadarc mounting bracket. Turn the power switch on. After the dwell period and oscillation starts, adjust the oscillation travel distance by rotating either or both of the limit switch stops as required to give proper front and rear electrode position. After the desired oscillation track is obtained, lock the stops in place by tightening the hex nuts against the stops.
2. If there is a major change in the speed control setting, the oscillation track will change, requiring readjustment of the limit switch stops.

D. MAINTENANCE

Before doing any of the following maintenance work, remove the line cord plug from its receptacle or turn the input power off at the power source if powered by an NA-3, NA-4 or NA-5. Remove the head from the Spreadarc for Steps 2, 3 and 4.

1. *Limit switches* – Twice a year, check the limit switch plungers by rotating them. They should turn freely. If they are "stiff", pull back the rubber boot and clean the plunger with a cleaning solvent. Apply a dry lubricant such as moly or graphite and put the rubber boot back in place.
2. *"V" tracks and bearings* – Clean, inspect and re-lubricate twice a year (more often under severe duty applications) as follows (see Figure 3):

   Remove the four screws (1) holding the limit switch bracket (2) to the top cover (3). Remove the four screws (4) holding the top and bottom track covers (5) in place and remove track covers. Clean the

Sec. T2.5.6 and L2.5.6 (Continued)

four "V" groove bearings (6) and the top and bottom "V" tracks (7) and inspect for wear.

Providing the tracks are not severely worn, re-lubricate the contact surface of the bearings and tracks with a graphite or moly filled grease, such as automotive chassis grease, and reassemble.

If the wear on the inside edge of the top track has reached .040, either interchange the top and bottom tracks if the bottom track is not severly worn, or replace both tracks. To remove the tracks, loosen the ½-13 hex head screws (8) which hold the bottom "V" bearings in place by rotating the screws (8) and holding the eccentric nuts (9) from turning. Rotate the eccentric nuts (9) to give maximum clearance of the bearings to the track. Remove the four screws (10) and (14) holding the control box (15) in place. Maintain support on the control box to prevent straining the leads from the motor.

While supporting the moving carriage, remove the eight hex head screws (17) holding the top and bottom tracks in place and remove the tracks by sliding them off the track support (18). Allow the top "V" bearing to rest on the track support. Do *not* loosen the screws holding the motor in place because it has been factory set to give the proper clearance between the rack and pinion. Inspect the four "V" bearings to see that they rotate freely and are not excessively worn.

Install the new tracks, or switched tracks, on the track support making certain that they are seated on the edges of the track support. Re-assemble all parts except for the top and bottom track shields and limit switch bracket.

To adjust the eccentrics on the bottom "V" bearings, tighten the ½-13 screws until snug. Rotate eccentric nuts to bring bottom bearings snug against the track. Hold eccentric nuts from turning and tighten ½-13 screws. Check for proper pressure by turning outer race of bottom bearings by hand. They must slip but there must be no vertical play in the carriage assembly. Readjust eccentrics if necessary. Lubricate tracks and bearings and install top and bottom track shields and limit switch bracket.

3. *Motor brushes* – With normal service, these brushes should last for many years. Check brushes every two years or whenever the unit is disassembled for changing tracks. Replace the brushes before the length is reduced to less than .25 inch.

4. *Motor gear reducer* – When the motor brushes are checked, also inspect the grease in the gear box. If it appears hardened or dirty, it should be changed as follows:

   Disassemble the unit as described in Step B. Do *not* loosen the motor mounting screws for the reason stated in Step B. Remove the four screws holding the gear case to the motor frame at the large flange. Remove the gear case from the motor. Remove as much as possible of the old grease from the gear case. Do not wash in solvent. Repack with Plastilube #2, Warren Refining Company, Cleveland, Ohio, or an equivalent grease, and reassemble.

5. *Control box* – Every six months inspect the control box. If needed, blow dirt out using low pressure air. Replace screw holding cover in place.

E. TROUBLESHOOTING

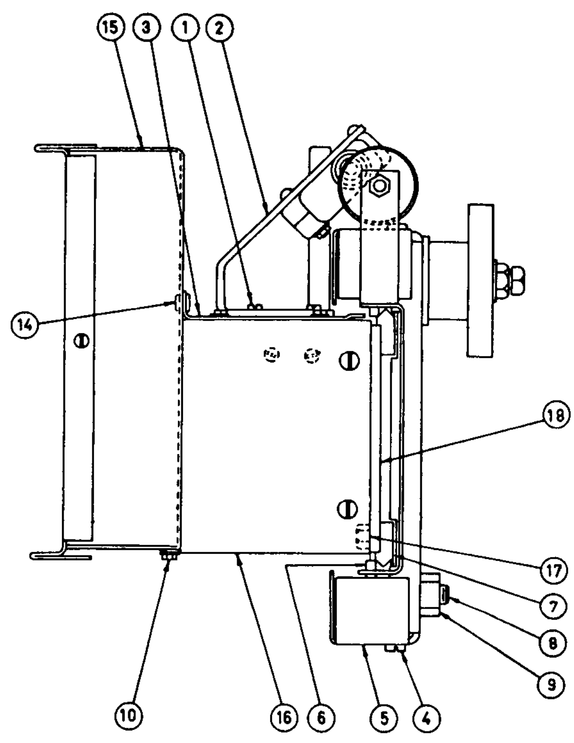
1. *Circuit Protection* – The 0.8 circuit breaker mounted on the control box door protects the control circuit and motor from short circuit conditions. It also protects from severe overload conditions such as an obstacle restricting carriage movement. If it opens, determine and correct the cause of the overload. To reset the circuit breaker, push the red button.

"The motor may or may not have an automatic thermostat mounted within the motor case.

If the motor has a thermostat and operated under server conditions, the thermostat may or may not open before the circuit breaker opens. The thermostat will close when the motor has cooled down.

If the motor does not have a thermostat; a jumper (T13962) must be installed on the terminal strip at positions #732 and #732A. See wiring diagram (M13447), on next page.

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Sec. T2.5.6 and L2.5.6 (Continued)

2. *Printed Circuit Board* — The P.C. board has light emitting diodes mounted at various locations to aid in troubleshooting a problem. The lights and their "on" functions are as follows:

   A – indicates front limit switch LS1 is activated.
   B – indicate rear limit switch LS2 is activated.
   C – indicates positive field voltage.
   D – indicates negative field voltage.
   E – indicates voltage to motor armature (will be dim when speed control is set at minimum).

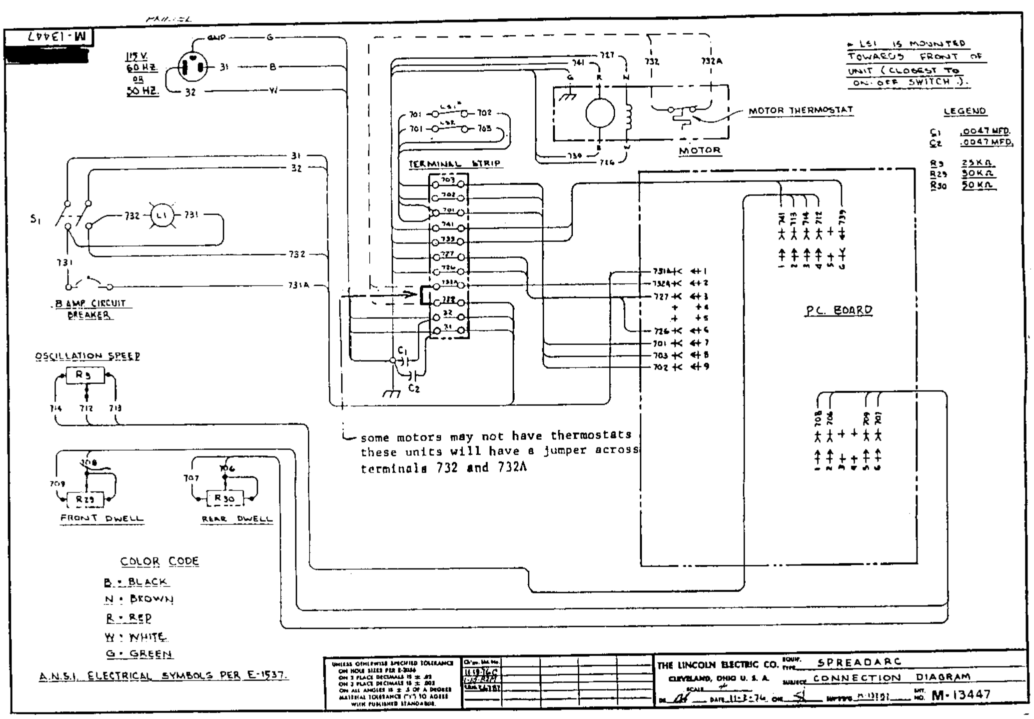
3. *Voltage Measurements* – All voltages are ±10%.

   a. 31 – 32 terminal strip – 115 volts AC.
   b. 32 – 731A terminal strip – 115 volts AC (0 if motor thermostat or circuit is open).
   c. 726 – 727 terminal strip – 105 to 120 volts DC (polarity depending on travel direction).
   d. 739 – 741 terminal strip – 90 to 100 volts DC, oscillation speed at maximum; 12 to 25 volts DC, oscillation speed at minimum.
   e. 701 – 702 terminal strip – 13 to 15 volts DC – limit switches not activated.
   f. 701 – 703 terminal strip – 13 to 15 volts DC – limit swtiches not activated.

4. *Resistance Measurements*

   a. 726 – 727 terminal strip – Motor field, should be 1200 to 1500 ohms.
   b. 739 – 741 terminal strip – Motor armature, should be 120 to 160 ohms.

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SPEED-FEED® DRUMS

⚠ WARNING 	FALLING EQUIPMENT can cause injury.	● Use equipment rated to lift weight of this drum. ● If possible, lift from bottom. ● For top lifting: — Lift only when cover locked in place. — Lifting device contact with underside of closing ring must be at least 38 inches. ● Never stand under a lifted load.

Sec. T2.5.7-A
(File as Sec. L2.5.10-A for IM-278)

General Installation

The drum must be set on a turntable which permits it to turn freely, allowing the wire to be paid off without tangling. Turntables can be purchased from a manufacturer or made by the user. (See **Figure 1**) A turntable consist of a stationary plate on the floor (1), a rotating plate (turntable) (2) centered on a large bearing (3), and a post (4) and arm(s) (5) for the eyelet(s) (6). At least one low friction insulated eyelet is required to guide the electrode. This is to help guide the wire out of the drum and prevent tangles or accidental grounding, which can cause personal harm and/or damage to the equipment (See **Figure 1** below for labeled illustration.)

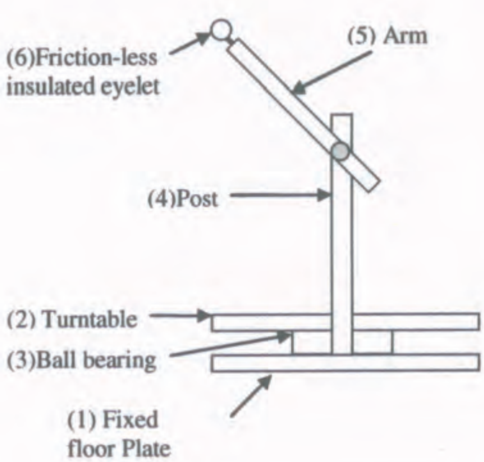


Figure 1

Hats which fit inside the drum core are necessary to prevent the electrode from flipping over the top of the drum core and becoming tangled.
Please visit the "Steel Hat Construction" document at http://www.lincolnelectric.com/knowledge/articles/content/steelhatconstruction.asp for specifications on how to construct permanent steel hats. Reusable fiber hats are available from the Lincoln Electric Company. **(The Lincoln Electric product number for the reusable fiber hats is ED020219).**

Drum Dimensions

1. Dimensions of SPEED FEED DRUMS

300 lb Drum	Dimensions
Outside Diameter (in)	23 3/8 ± 1/16 (56.8 cm ± 0.16 cm)
Height (in) (without cover)	17 3/4 +1/8 -1/4 (45.1 cm + 0.32cm -0.64 cm)

600 lb & 1000 lb Drum	Dimensions
Outside Diameter (in)	23 3/8 ± 1/16 (56.8 cm ± 0.16 cm)
Height (in) (without cover)	34 3/4 +1/8 -1/4 (88.3 cm + 0.32 cm –0.64cm)

2. Dimensions of Drum CORE

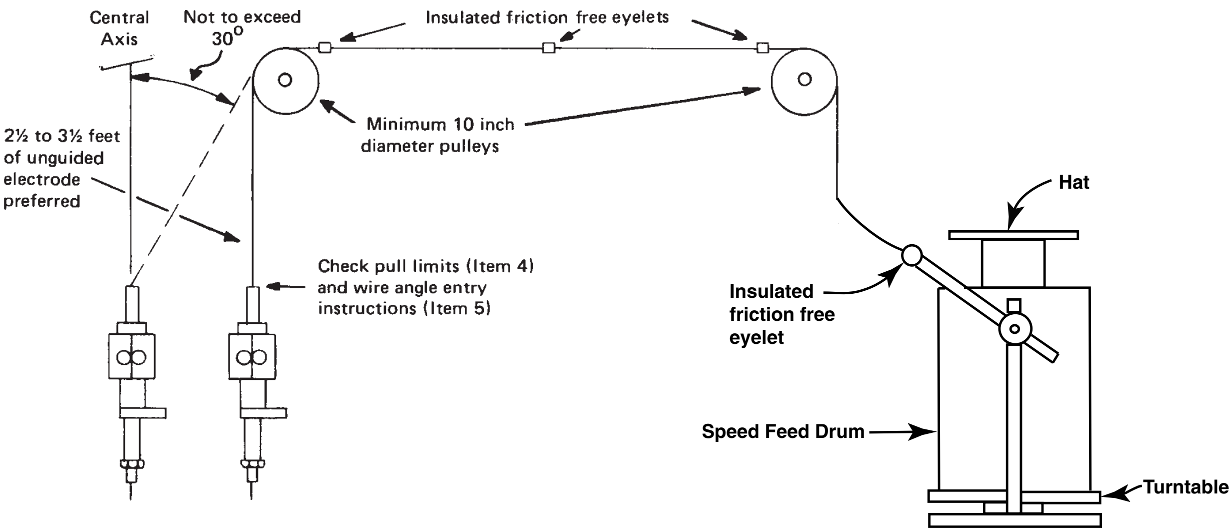
300 lb Drum	Dimensions
Inside Diameter (in)	16.0 ± 1/2 (40.6 cm ± 1.3 cm)
Inside height of core (in)	17 1/16 +1/8 -1/4 (43.3 cm + 0.32 cm -0.64 cm)

600 lb & 1000 lb Drum	Dimensions
Inside Diameter (in)	16.0 ± 1/2 (40.6 cm ± 1.3 cm)
Inside height of core (in)	34 3/8 +1/8 -3/8 (87.3 cm + 0.32 cm -0.95 cm)

Sec. T2.5.7-A (Continued)
File as Sec. L2.5.10-A for IM278)

INSTALLATION INSTRUCTIONS

SPEED-FEED® DRUMS



Drum Setup

***ALWAYS** use caution, proper equipment and appropriate procedures when moving the drums. Improper handling may cause personal injury and/or damage to the product. For more information on safe drum handling please visit:*

http://www.lincolnelectric.com/knowledge/articles/content/drumhandling.asp

Drum Hat Installation

1. Before removing the lid, set the drum on an appropriate dereeler. Remove the drum lid used for shipping but DO NOT remove the center cardboard core. **(Figure 2).**



Figure 2

2. Place the drum hat on the drum core **(Figure 3).**



Figure 3

3. Load the wire from the drum past the hat (Figure 4) and into the low friction insulated eyelet(s) **(Figure 5).** The eyelet(s) must be between a 20 and 40 degree angle with respect to the vertical axis of the drum.



Figure 4



Figure 5

From this point load the wire according to the process which you are using. Appropriate wire conduit or insulated guides should be used to prevent wire from making contact with objects at welding ground potential.

Installation of automatic Drum Brakes

High electrode feed speeds (generally >300 inches per minute) may require the use of a turntable with an automatic brake to stop the drum rotation from overrun at the end of the weld. For more information on drum brakes and for instructions on how to install the brake into the turntable visit

http://www.lincolnelectric.com/knowledge/articles/content/speedfeeddrums.asp

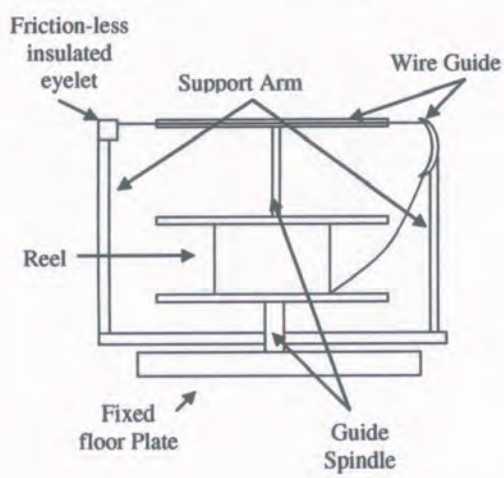
Sec. T2.5.7-B (FOR IM305)
(File as Sec.L2.5.10-B for IM278)

SPEED-FEED® REELS

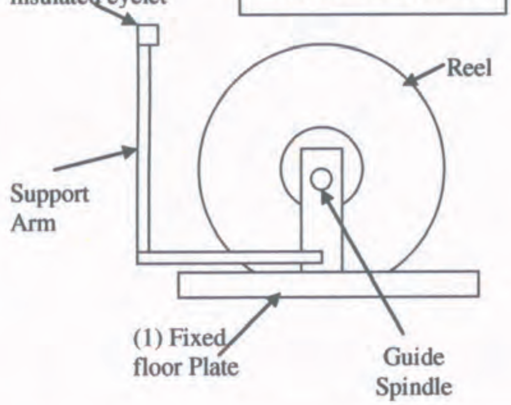
General Installation

The Reels require dereeling equipment that permits them to rotate freely as the electrode is used. Dereelers can hold the reels in vertical or horizontal position, depending on the application. The dereeler needs to include at least one low friction insulated eyelet.

Horizontal Dereeler



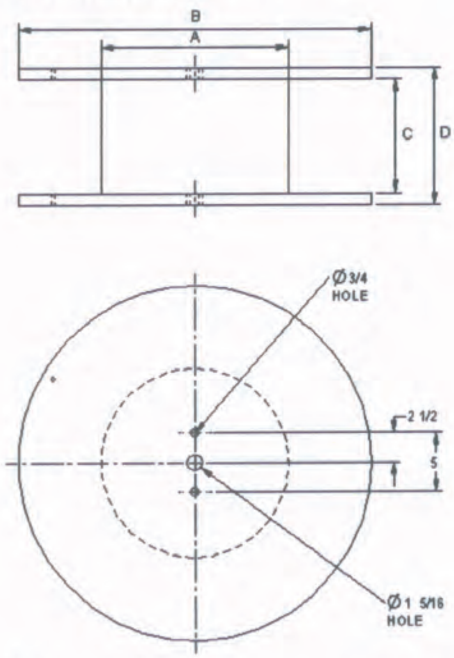
Vertical Dereeler



Reel Setup

***ALWAYS** use caution, proper equipment and, appropriate procedures when moving the reels. Improper handling can cause personal injury and/or damage to the product. **

Reel Dimensions



(lbs. Wire)	A (in.)	B (in.)	C (in.)	D (in.)
Solid Wire				
300	12	23 3/4	6	7 1/4
600&750	16	30	9 5/8	11 5/8
1000	12	30	9 5/8	9 5/8
Cored Wire				
300	15	23 3/4	9 1/4	10 1/4
600&750	16	30	9 5/8	9 5/8

*A spacer may be needed on the dereeler shaft for smaller reels to prevent instability.

INSTALLATION INSTRUCTIONS
SPEED-FEED® REELS

Installation of Automatic Reel Brakes

The high electrode feed speeds (generally >300 inches per minute) may require the use of a turntable with an automatic brake to stop the reel rotation from overrun at the end of the weld. For more information on brakes and for instructions on how to install them visit the Lincoln Electric website at **http://www.lincolnelectric.com/knowledge/articles/content/speedfeeddrum.asp** and view the Speed Feed document.

Wire Feeding

The position of the reel with respect to the wire feeder will vary from job to job. Proper placement of the wire is important to minimize the complications during wire feeding.

Improper Installation

A. Improper installation can:

1. Pull kinks into the wire feeder which can not be straightened.
2. Cause milling of the electrode resulting in clogged guide tubes and liners.
3. Overload the wire feed drive motor.

Precautions

B. To prevent installation complications observe the following precautions: (See **Figure 3**)

1. Pull the electrode as short a distance as possible.
2. Guide the electrode through friction free insulated eyelets which are properly spaced. Do not pull the wire through small diameter tubes.
3. Minimize sharp bends in the electrode. When a change in direction is required use free-wheeling idler rolls of at least 10 inches (25.4 centimeters) in diameter.
4. Position the eyelets and idler rolls so there is as little loading on the feed motor as possible. Ideally the total force at the head to move the electrode (or electrodes in Twinarc welding) should not exceed 20 pounds (89 newtons).
5. Be certain the electrode enters the straightener or ingoing guide at an angle no greater than 30° from its central axis.
6. Load Speed-Feed reels on the turntables so they are centered and balanced.
7. Do not over tighten the electrode in the drive rolls.

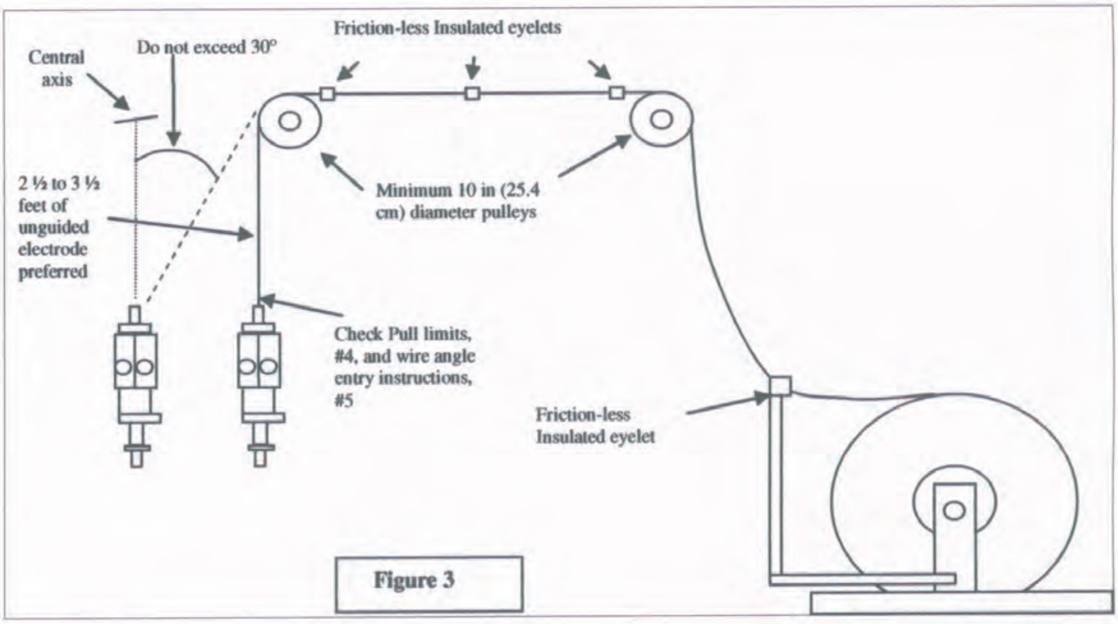
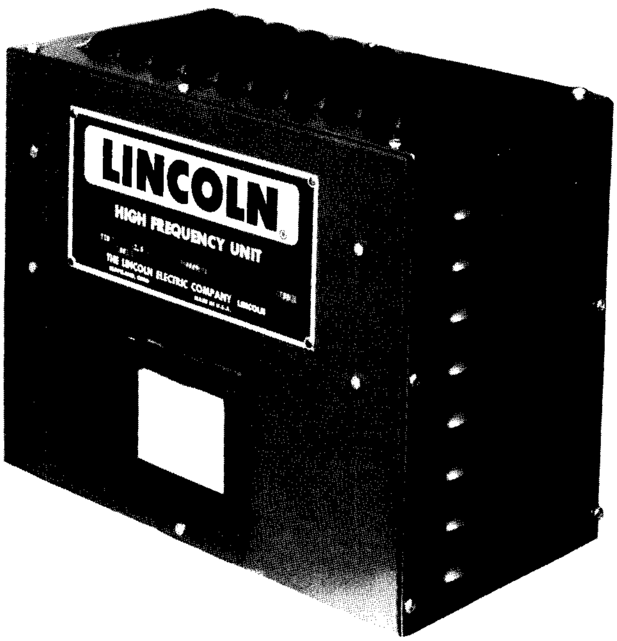


Figure 3

SEC. T2.5 – OPTIONAL FEATURES INSTALLATION – CONT'D

Sec. T2.5.8

K238 High Frequency Generator



NOTE: When using the K238 HF unit, the NA-5 control **must** have a code above 8300 and the equipment being used must have the following special high frequency insulation:

1. Factory installed between head motor and gearbox.
2. Factory provided for head mounted flux hopper.
3. Factory provided for wire reel mounting bracket.
4. Factory provided for head mounting.**

** Fixture builder (''F'') models, which do not have head mounting insulation, must be mounted with a minimum of 1 inch thick polyester laminate providing the head with no less than 1 inch exposed and ½ inch unexposed electrical clearance between the head mounting bracket and mounting surface (including electrically common mounting hardware).

A. GENERAL

The K238 High Frequency Unit supplies high frequency power to the welding leads for more positive starting on some jobs. It operates on 115 volts, 50 or 60 hertz power supplied from the NA-5. The welding circuit of the K238 is rated at 750 amps, 100% duty cycle, welding current. It *cannot* be used with the Linc-Fill Starting Relay or the Spreadarc options. It is to be used only with the "hot starting" start sequence.

B. HIGH FREQUENCY INTERFERENCE PROTECTION

It is important that the energy from the High frequency unit be utilized at the arc and the amount radiated kept at a minimum. The following instructions *must* be followed to minimize the amount of RF radiation as required by the FCC, to prevent malfunctioning of the NA-5 control, and for safety.

1. The work terminal at power source *must* be connected to a driven ground at the welder or to a water pipe that enters the ground within 10 feet of the power source. The ground connection should be securely made and as short as possible using cable of the same size as the work cable, or larger. Grounding to the building frame or a long pipe system can result in re-radiation, effectively making these members radiating antennas.
2. Keep the work and electrode leads between the high frequency unit and the arc as close together as possible. Lengths should be as short as possible but never exceed 25 feet. Tape the leads together where practical.
3. Be sure the rubber covering the electrode and work cables is free of cuts and cracks that allow high frequency leaking. Use cables with high natural rubber content, such as Lincoln Stable-Arc®, which more effectively resists high frequency leakage than neoprene and other synthetic rubber insulated cables.
4. The control leads from the high frequency unit to the NA-5 must be shielded as specified in the ''Electrical Connections'' section.
5. Keep the covers on the High Frequency Unit.
6. Mount the wire reel as close to the head as possible. The electrode and reel become an antenna, radiating energy into space. Make certain the electrode cannot touch the NA-5 control box.
7. Make sure all parts carrying high frequency are insulated from all other parts. Even though the parts are not grounded, they might become radiating antennas.
8. Route the wire feed motor leads, flux hopper leads and any other remote control leads so they are no closer than 6″ to the High Frequency unit, head mounting parts, wire reel, wire reel mounting, welding cables, etc. Use lead clamps as necessary.

C. ELECTRICAL CONNECTION

While observing all the points made in above Section (B), make the electrical connections as follows:

1. Turn off all input power to the power source and NA-5. Mount the High Frequency Unit as near to the head as possible but at least two feet away from the NA-5 control box.
2. Connect electrode welding cables from the High Frequency Unit to the automatic head and to the K215 input cable assembly at the NA-5 control box per M14156.
3. Connect work welding cables from the High Frequency Unit to the power source and to the work per M14156.
4. Remove the cover from the High Frequency Unit. Install the appropriate connector for the control lead conduit in the hole provided to the right of the terminal strip.
5. Loosen the screws holding the NA-5 control box cover closed and open the the door to gain access to the terminal strip.

Sec. T2.5.8 (Continued)

6. Remove the plastic hole plug from the hole on the left side of the NA-5 control box. Install the appropriate connector for the control lead conduit.

7. Install a shielded five conductor control cable, having #18 AWG or larger control leads, from the High Frequency Unit to the NA-5 control box. The shielding must be grounded to the control boxes. Connect the leads as follows:

   a. High-Freq terminal strip #31 to NA-5 control terminal strip #31.
   b. High-Freq terminal strip #87 to NA-5 control terminal strip #87.
   c. High-Freq terminal strip #681 to NA-5 control terminal strip #681.
   d. High-Freq terminal strip #510 to NA-5 control terminal strip #610.
   e. High-Freq grounding stud to NA-5 control box grounding stud.

8. Remove the #67 black lead from the NA-5 terminal strip electrode polarity connection and tape the terminal of the removed lead.

9. Connect a #18 AWG, or larger, electrode sensing lead from the bolted electrode lead connection (per M-14156) to the appropriate NA-5 terminal strip polarity connection (replacing the #67 black lead referred to in 'Electrode Polarity', Sec. T2.3.1).

D. OPERATION

When the NA-5 "Start" button is pushed, 115 volts AC is applied to leads #31 and #87, energizing the High Frequency Unit. When the welding arc is established, 110 volts DC is applied to #610 and #681 which energizes 1CR in the High Frequency Unit. This opens the 1CR normally closed contact – which is in series with the 115 volt AC input power circuit – and de-energizes the High Frequency Unit.

WARNING: When using the High Frequency Unit, the "hot starting" start sequence is to be used (see "Means of Arc Striking", Sec. T3.5.1). "Cold starting" is *not* to be used; do not allow the electrode to touch the work when inching down because this results in the High Frequency Unit becoming energized when the electrode touches the work.

E. MAINTENANCE

The only routine maintenance required on the High Frequency Unit is to inspect the spark gaps monthly and to maintain the setting specified on the spark gap cover plate.

WARNING: Use extreme caution when this adjustment is made. The voltage in this part of the circuit is dangerously high when the unit is energized. Turn off the NA-5 control, turn off the power source, and disconnect the input power to the power source before removing the screw that holds the access door in place.

Replace the screw holding the access door closed after the adjustment is made. Only a qualified electrician is to do the maintenance work.

SEC. T2.5 – OPTIONAL FEATURES INSTALLATION – CONT'D

Sec. T2.5.9

K219 Flux Hopper Kit (Standard on the NA-5S)

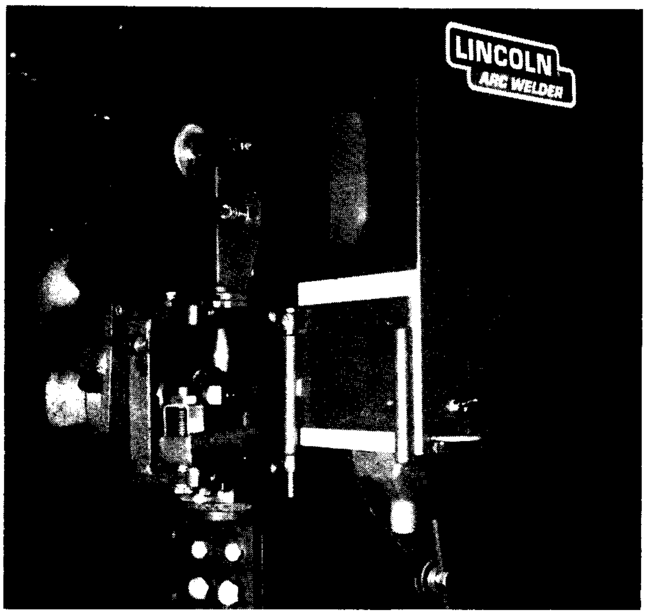
The flux hopper can be mounted on the NA-5N or NA-5NF heads for submerged arc welding. Installation instructions are shipped with each kit. Operation is as follows:

1. Flux valve switch on ''off''. The flux valve is then on manual operation and must be held open. It will close when released.
2. Flux valve switch on ''on''.

   When starting ''cold'', the valve automatically opens when the electrode makes electrical contact with the work while the inch down pushbutton is pressed.

   When starting ''hot'' or ''cold'', the flux valve automatically opens when the ''Start'' button is pushed. It remains open until the Burnback timer times out, or the flux valve switch is turned ''off''.

February 1982



Sec. T2.5.10

K337 (-10 or -100) Weld Timer Module

Permits setting of weld time for an adjustable period. Eliminates need to press stop button. Instructions are included with kit. The Timer units are adjustable by means of thumbwheel switches over the following ranges:

K337-10	0.00 to 9.99 sec.
K337-100	00.0 to 99.9 sec.

February 1982

Sec.T2.5.11

K336 Remote Interface Module

Permits connection of customer-furnished remote start-stop and inch momentary contact closure or momentary 24 volt signals. Also used when a single remote signal is desired to start or stop multiple heads. Installation and application instructions are included with the kit.

NOTE: This Module replaces the earlier K336 Remote Pushbutton Interface Module.

February 1982

K373 Analog Interface Procedure Control

This kit mounts on the right side of the NA5 control box with three screws and connects to the NA5 procedure kit receptacle and terminal strip.

This control provides circuit isolated interface for 0 to 10 volts DC analog signal levels, linearly representing 0 to 100% of the rated range of the wire speed and voltage control of the NA5 system. Comprehensive installation and operation instructions are included with the control.

April 1988

Sec. T2.5.12 (Cont.)

Linc-Fill™ Starting Relay (K237)

When using the Linc-Fill Starting Relay Kit, it is also necessary to use a K334 Optional Start Control. *Do not* use the starting relay circuit when using high frequency. Install the kit following the instructions supplied with the kit.

The Linc-Fill Starting Circuit was designed for especially difficult long stickout procedures for which the NA-5 adjustments of acceleration, strike, or start controls do not give satisfactory starting. It bypasses the normal path for the welding current and puts the current into the wire at the long stickout extension guide. This permits starting with a short electrical stickout and then switching to a long electrical stickout once the arc is established. Only a portion of the current is actually bypassed to the extension guide. The remainder of the current follows the normal path in through the contact tip. This heats up the wire while the arc is being established. Then about one second after the arc is struck, the Linc-Fill Starting Relay drops out and all of the current passes through the normal path through the nozzle contact tip.

Linc-Fill Starting Relay Circuit Operating Instructions:

1. Set the start control timer for about one second delay. The start wire speed is set for about 50% to 75% of the Weld speed and the Start voltage control is set about the same as the Weld voltage.
2. Cut the end of the electrode to a sharp point and make a test weld. Make certain that the starting relay drops out after the start time has expired.

If stubbing occurs when the arc first strikes, the 'Inch Wire Speed' may be set too high or the strike or start voltage may be set too low.

If stubbing occurs when the start time expires, the start wire speed may be set too low or the start voltage is set too high.

The lead from the Starting Relay and the nozzle contact assembly which accompanies the kit is 15 ft. of #12 wire. This has been found to give the proper amount of bypass current. If the length of lead sent with the kit is not the desired length for the relay to guide assembly lead, a new lead can be made per the table below. Any of these leads should give the same amount of bypass current.

Sec. T2.5.12 (Cont.)

If Length of Cable from Starting Relay to Extension on Nozzle is:	Use Wire size
8–11 feet	14
10–14 feet	13
13–17 feet	12
16–22 feet	11
20–28 feet	10
32–45 feet	8
51–71 feet	6

February 1982

Sec. T2.5.13

K334 Start and Crater Controls

Easily installed procedure and timer boards to permit adjustment of wire speed and voltage. Can be installed to function at either the start of the weld or at the end for crater filling. Instructions are included with the kit.

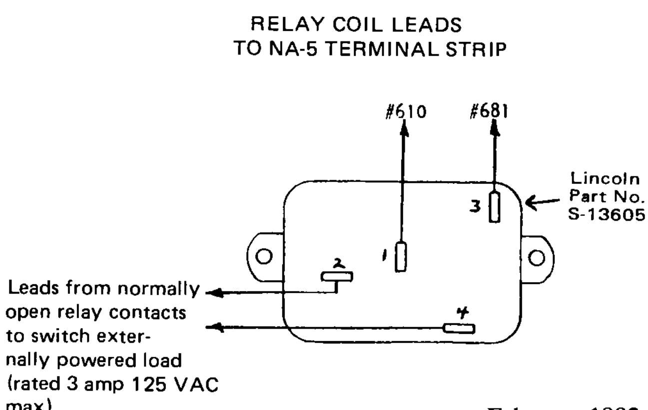
February 1982

Sec. T2.5.14

Current Relay (S13605)

Useful for fixture builders and others who need a signal indicating that welding current is flowing. Relay contacts (#2 and #4) will close and remain closed when welding. Mounts inside the NA-5 control box using the two holes provided on the bottom left side with #6 screws and nuts (not provided).

The electrical connections of the current relay (leads and terminals are not provided) to be made per diagram below:



February 1982

Sec.T2.5.15

K224 Solid-State Remote Field Control

(Discontinued)

Required when using a SAF-600 or SA-800 motor generator type power source. Mounting instructions are shipped with each kit. Electrical connections are included in the appropriate connection diagram, Sec. T2.3.4-A.

July 1983

Sec. T2.5.16

K223 Solenoid Kit

The solenoid includes a valve for control of the water flow when using the cooling attachment on the K148 or K239 contact nozzle assembly. It opens when the "Start" button is pressed and closes when the Burnback timer times out. Installation instructions are shipped with each kit.

February 1982

Sec. T2.5.17

K58 Magnetic Separator

The K58 is a permanent magnet type separator designed to fit the top of the standard fill funnel of the continuous flux feed system or the top of the K219 flux hopper of a full automatic head.

The purpose of the separator is to remove magnetic materials such as mill scale and any other extraneous magnetic materials which may have been recovered along with the flux to be processed.

It is important to remove these magnetic particles from the flux which is to be reused in the continuous flux feeding system. If the magnetic material is not removed it will gather around the nozzle of the gun and impede or shut off the flux flow when making relatively long welds or welding continuously. The magnetic particles can also cause porosity in the weld.

Fit the magnetic separator into the funnel or hopper. Pour the flux to be reclaimed into the top pan of the separator. The separator is designed so the flux flows around three permanent magnets. The magnets remove all magnetic particles. When the magnets become covered with their full load, they automatically stop the flux flow. When the flux flow stops, remove the separator from the funnel or hopper. Turn it over and open the panel that covers the magnets. Remove the magnetic particles with brushing or an air blast. Be careful to protect yourself and others in the area from flying particles.

The magnetic separator is used with all Lincoln mild steel fluxes – 760, 761, 780, 781, 860, and 880. Do not use the magnetic separator with any stainless steel, alloy, or hardsurfacing flux except H-535. The magnetic separator removes some of the alloying elements from these fluxes thus changing their characteristics.

July 1983

Sec. T2.5.18

K310 Flux Screen

The unit was designed to fit the top of either the standard fill funnel of a continuous flux feed system of a K58 magnetic separator. The unit has a steel screen with .065 to .075 openings and an air vibrator attached to the frame. The vibrator can be used with air line pressures ranging from 20 psi thru 100 psi.

For ease of handling, the user should connect the incoming air line to the ⅛" pipe elbow with the aid of a fast disconnect type air coupling.

July 1983

K349 MULTI-PROCEDURE KIT

NOTE: References to NA-5 also include NA-5R units, except where specifically noted.

Sec. T2.5.19

A. GENERAL

The Multi-Procedure Kit is an optional control box designed to mount and connect to NA-5 automatic controls *above Code 8300 and the NA-5R*. The kit provides three additional Weld mode procedure settings of wire feed speed and voltage, allowing the choice of four NA-5 Weld mode procedures. Weld Procedure 1 is set with the standard NA-5 Weld Controls and Weld Procedures 2, 3, and 4 are set with the weld controls provided under the kit's lockable security panel. Any one of the four weld procedures may be selected by the operator before or during welding using the kit's panel selector switch, or by connection of customer-furnished remote signals. Lights on the front panel of the kit indicate the selected weld procedure, and the NA-5 meters show that procedure when the NA-5 Weld mode light is on. **NOTE:** NA-5R controls do not have a Weld mode light, nor Mode Selector Switch. The meters *always* display the procedure set by the selected procedure controls.

Maximum versatility is obtained when the NA-5 is connected to a DC-400 through DC-1500 type power source or SAF-600 and SA-800 with the Solid-State Remote Field Control. When used with a SAM or R3S power source, the voltage range of the required procedures may exceed the range covered by the power source remote control, and it would, therefore, be impossible to obtain the range of set procedures without readjustments at the power source.

B. INSTALLATION TO THE NA-5

1. Turn off all input power to the NA-5 *at the power source*.
2. Remove the four screws securing the corners of the S16722 Warning label on the right side of the NA-5 control box and remove the Warning label to expose the 1-inch square access hole. **REMOUNT THE WARNING LABLE, WITH ITS MOUNTING SCREWS, ABOVE THE DECAL ON THE MULTI-PROCEDURE KIT SIDE COVER PANEL.**
3. Remove the top-most screw from the right side of theNA-5 control box and save for use in Step 4 below.
4. Route the Multi-Procedure Kit plug harness into the NA-5 control box through the square access hole. Then align the Multi-Procedure Kit's top and two bottom mounting holes with the holes in the NA-5 box side and secure with the removed top screw and the two screws provided with the kit.
5. Open the NA-5 control box door and locate the *12-cavity* harness receptacle lying near the lower right rear corner of the box. Remove the receptacle's jumper plug (T-13498-1) and save for future re-use.
6. Remove the jumper leads from the Multi-Procedure Kit harness plug and connect the plug to the NA-5 harness receptacle.

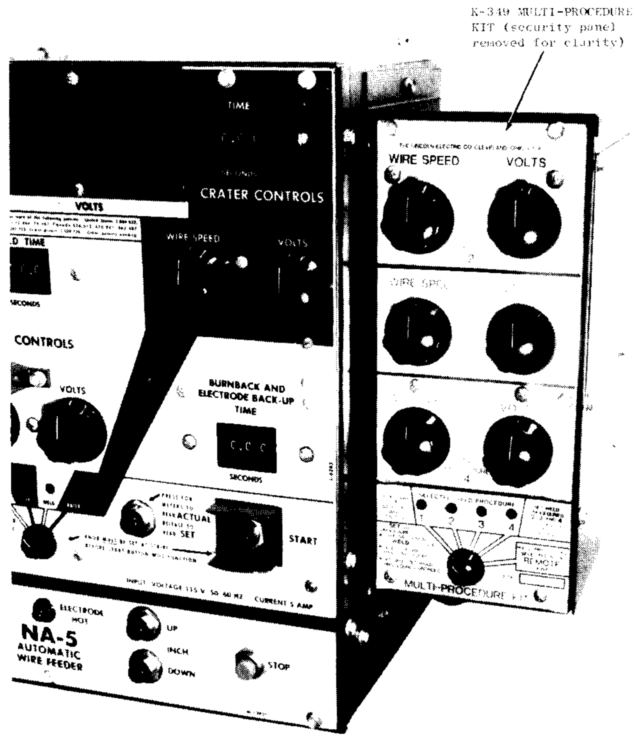




Figure 2

Sec. T2.5.19 (Continued)

NOTE:

1. If the Multi-Procedure Kit is removed from the NA-5, both the Warning label and the jumper plug (removed in Steps 2 and 5 above) must be replaced on the NA-5.
2. Access to the circuit board mounting screws located between the NA-5 and kit control boxes is obtained by removing the kit's top mounting screw and hinging the box down.

If weld procedure selection is to be done *only* with the kit's panel selector switch, the Multi-Procedure Kit installation is now complete. If it is desired to employ remote signals for weld procedure selection, refer to Section C below.

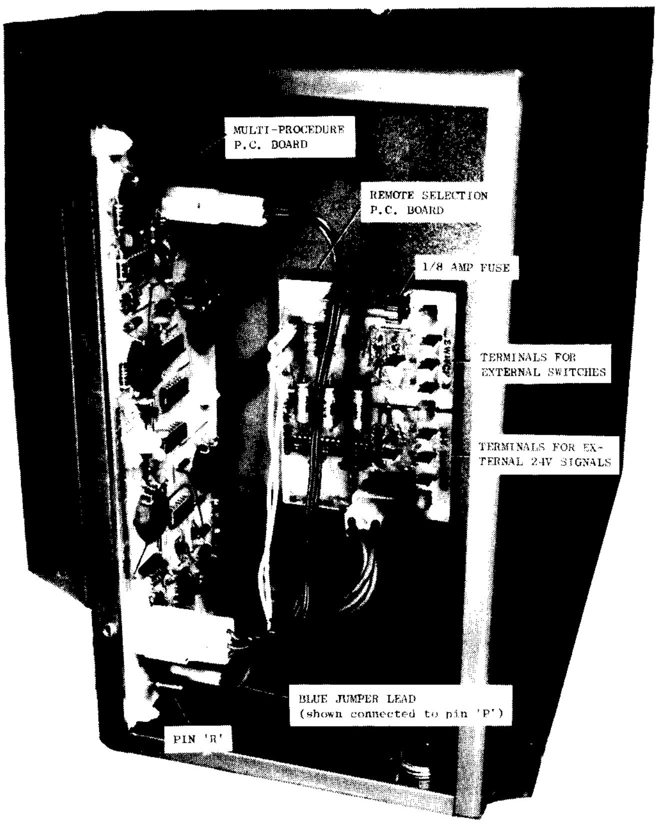


Figure 3

C. PROCEDURE SELECTION WITH REMOTE SIGNALS

1. Procedure Selection

   The Multi-Procedure Kit circuitry is such that the procedure selection is performed on a priority basis, in which the selection of a higher weld procedure number overrides the selection of any lower weld procedure number. Therefore, selection of Weld Procedure 3 overrides the selection of Weld Procedure 2, and Weld Procedure 4 overrides the selection of any other weld procedure(s). The circuit also provides that if Weld Procedure 2, 3, or 4 is *not* selected, then Weld Procedure 1 is automatically selected.

2. Remote Selection Signals

   The Remote Selection Board of the Multi-Procedure Kit permits remote selection of Weld Procedures 2, 3, and 4 by user-supplied external signals and provides protective isolation of the kit's control circuitry from these signals.

   The external signals can be switch closure or 24 volt signals per the following:

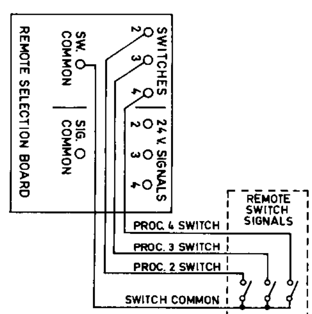
   SWITCHES – Maintained closure of contacts rated for 24 volts, 10 milliamperes DC service.

   24 VOLT SIGNALS – Application of a 24 volt ±10% AC or DC signal capable of 10 milliamperes per input.

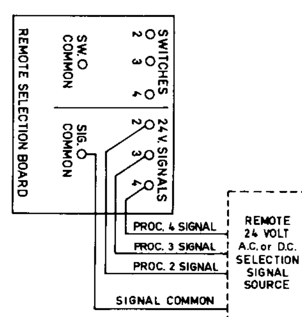
3. Remote Signal Connections

   a. Turn off the input power to the NA-5 and remove the Multi-Procedure Kit side cover panel by removing the two lower panel screws.
   b. Route leads from the external selection signals into the Multi-Procedure box through the cable clamp provided, or appropriate user-provided replacement box connector. **NOTE:** A plug buttoned hole cluster is also provided on later units to accept mounting of an MS-3102A-18 type box receptacle.*
   c. Using .250 × .032 quick-connect female lead terminals, connect the remote leads to the proper Remote Selection Board terminals per the appropriate connection diagram shown below:

* Such as L.E. Part No. S12021-11 (4-socket) receptacle for S12020-3 (4-pin) plug with S12024-1 cable clamp.



CONNECTIONS FOR SWITCH SIGNALS



CONNECTIONS FOR 24 VOLT SIGNALS

CAUTION: The switch common and the 24 volt signal common terminals are *not* electrically common with each other and are, therefore, not interconnectable. Although the kit's Remote Selection Board is fuse protected, improper signals or connections may possibly cause damage to the circuit.

4. Exclusive Remote Selection While Welding

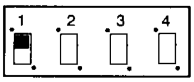
   The Multi-procedure board inside the kit control box can be configured to permit the kit's panel selector switch to be fully functional while welding, or it can be configured to disable the panel selector switch thus permitting remote selection of weld procedures. (See Figure 3.)

   The panel selector switch is fully functional in either configuration when not welding.

Sec. T2.5.19 (Continued)

a. Configuring the Multi-Procedure Board for weld procedure selection from the panel (non remote).

On older models when the blue jumper is connected to pin "P" the kit's panel selector switch is fully functional. *This corresponds to setting the DIP switch to the UP position on newer versions of the Multi-procedure board.*



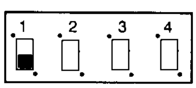
Blue Jumper to PIN "P"

Newer Versions of the Multi-procedure Board | Older Versions of the Multi-procedure Board

This configuration must be used if remote procedure selection is not used, or if it is desired to permit panel selector switch override of remotely selected procedures while welding. However, remote procedure selection will be disabled if the panel selector switch is not set to the REMOTE position.

b. Configuring the Multi-Procedure Board for Remote weld procedure selection.

On older models when the blue jumper is connected to pin "R" the kit's panel selector switch is disabled allowing for weld procedure selection from a remote source. *This corresponds to setting the DIP switch to the DOWN position on newer versions of the Multi-procedure board.*



Blue Jumper to PIN "R"

Newer Versions of the Multi-procedure Board | Older Versions of the Multi-procedure Board

This configuration provides exclusive remote selection of weld procedures while welding, regardless of the position of the kit's panel selector switch. This prevents selector switch override of the remotely selected weld procedure. If the selector switch is not set to the REMOTE position, the weld procedure will automatically alter to that selected by a remote signal when the weld is started and return to the selector switch procedure when the weld cycle has ended.

D. OPERATION

1. Panel Controls

   a. **Panel Lights** – The Multi-Procedure Kit panel lights always indicate the weld procedure number which is presently selected. However, the selected weld procedure is not functional nor displayed on the NA-5 meters unless the NA-5 WELD mode light is on.*
   b. **Panel Selector Swtich** – The Multi-Procedure Kit panel selector switch allows the selection of any of the four weld procedures by rotating the knob to the positions for Weld Procedure 1, 2, 3 or 4. By rotating the selector switch knob to the REMOTE position, the weld procedure is selected by a remote signal connected to the kit as described in Section C. The kit's panel lights will indicate the selected weld procedure.
   c. **Procedure Controls** – The standard NA-5 Weld Controls are used to set the Wire Speed and Volts for Weld Procedure 1. Weld Procedures 2, 3, and 4 are set using the appropriate Wire Speed and Volts controls located under the lockable security panel of the Multi-Procedure Kit. The weld procedure control settings are functional and displayed on the NA-5 meters only when the NA-5 WELD mode light is on and the specific Weld Procedure number has been selected, as indicated by the kit's panel lights.*

2. Presetting the Weld Procedures

   a. Set the NA-5 mode selector switch to WELD position.*
   b. Select Weld Procedure 1 using the Multi-Procedure Kit panel selector switch.
   c. Adjust Weld Procedure 1 controls (on NA-5 panel) so the NA-5 meters display the desired values of wire feed speed and arc voltage.
   d. Repeat Steps b and c above for Weld Procedures 2, 3, and 4 as required for the application.

3. Welding *Without* Remote Selection of Weld Procedures

   a. The Multi-Procedure board must be configured to "weld procedure selection from the panel", as originally shipped. (See Section C.4.)
   b. Select the desired Weld Procedure number using the Multi-Procedure Kit panel selector switch.
   c. Start the weld, and the selected weld procedure will become operative when the NA-5 WELD mode light turns on, indicating that the weld mode of the welding cycle is in progress.*
   d. The selected weld procedure will remain operative as long as the NA-5 weld mode is operative, or until another weld procedure is selected during the weld mode.

4. Welding *With* Remote Selection of Weld Procedures

   a. Set the Multi-Procedure Kit panel selector switch to the REMOTE position.
   b. Select the desired Weld Procedure number using the appropriate remote selection signal. (Refer to Section C.)
   c. Start the weld, and the remotely selected weld procedure will become operative when the NA-5 WELD mode light turns on, indicating that the weld mode of the welding cycle is in progress.*
   d. The remotely selected weld procedure will remain operative as long as the NA-5 weld mode is operative, or until another weld procedure is selected during the weld mode.*

Sec. T2.5.19 (Continued)

E. SECURITY OF WELD PROCEDURE SETTINGS

There are two means provided to prevent or limit unauthorized readjustments of the Multi-Procedure Kit voltage and wire feed speed controls once set to the desired procedure.

1. Once the procedure is set, the security panel of the Kit can be locked to prevent access to the control knobs.
2. The control range of the procedure control knobs can be limited to either about 3% or about 15% of the full range control by installing a knob rotation stopscrew to any or all of the control knobs. This stopscrew is installed in the same manner as described for the NA-5 Control (see Sec. T3.9.)

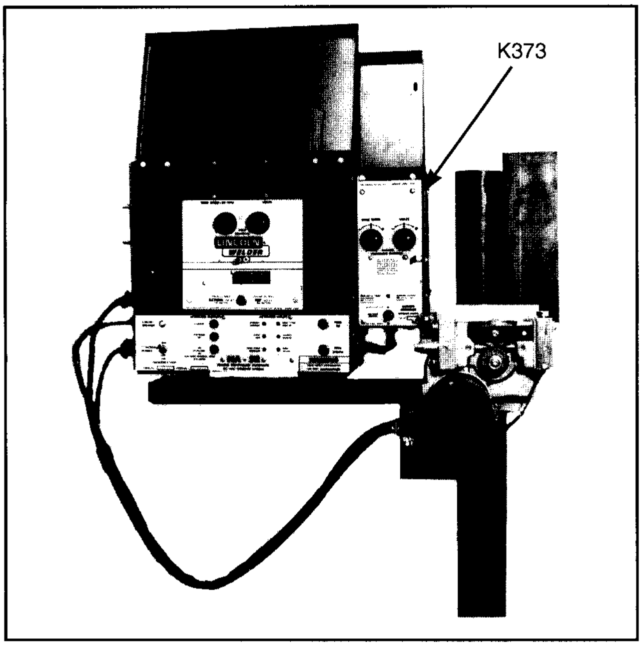
F. MAINTENANCE

Every three months, inspect the control box. If needed, blow dirt out using low pressure dry air. No other maintenance should be required.

* Except when used with NA-5R Controls — see "Note" in Section A.

K-373 ANALOG INTERFACE PROCEDURE CONTROL

Sec.T2.5.20
(**NOTE:** Reference to NA-5 also include NA-5R units, unless specifically noted.)



A. DESCRIPTION

The Analog Interface Procedure Control is an optional control box designed to mount and connect to NA-5 automatic controls *above Code 8300* and the NA-5R. The control provides circuit isolated interface for remote, user-provided, 0 to 10 volt DC analog signal levels to linearly set the NA-5 weld procedures between 0 and 100% of the rated range of wire feed speed and arc voltage. The kit also provides ±5% procedure override controls under a lockable security panel, and a selector switch to permit the choice of procedure setting control using remote analog signals or the standard NA-5 weld controls.

Maximum versatility is obtained when the NA-5 is connected to a DC-600, DC-1000 or DC-1500 type power source or SAF-600 and SA-800 with the Solid State Remote Field Control. When used with a SAM or R3S power source, the voltage range of the required procedures may exceed the range covered by the power source remote control, and it would, therefore, be impossible to obtain the range of set procedures without readjustments at the power source.

B. INSTALLATION TO THE NA-5.

1. Turn off all input power to the NA-5 *at the power source.*
2. Remove the four screws securing the corners of the S16722 Warning label on the right side of the NA-5 control box and remove the Warning label to expose the 1-inch square access hole. **REMOUNT THE WARNING LABEL, WITH ITS MOUNTING SCREWS, ABOVE THE DECAL ON THE ANALOG INTERFACE KIT SIDE COVER PANEL.**
3. Remove the top-most screw from the right side of the NA-5 control box and save for use in Step 4 below.
4. Route the Analog Interface Kit plug harness into the NA-5 control box through the square access hole. Then align the Analog Interface Kit's top and two bottom mounting holes with the holes in the NA-5 box side and secure with the removed top screw and the two screws provided with the kit.
5. Open the NA-5 control box door and locate the *12-cavity* harness receptacle lying near the lower right rear corner of the box. Remove the receptacle's jumper plug (T13498-1) and save for future re-use.
6. Remove the jumper leads from the Analog Interface Kit harness plug and connect the plug to the NA-5 harness receptacle.
7. Connect the red 531B and 532 leads to the 531B and 532 terminals on the right side of the upper NA-5 terminal strip.

   NOTE:

   (a) If the Analog Interface Kit is removed from the NA-5, both the Warning label and the jumper plug (removed in Steps 2 and 5 above) must be replaced on the NA-5.

   (b) Access to the circuit board mounting screws located between the NA-5 and kit control boxes is obtained by removing the kit's top mounting screw and hinging the box down.
8. If the Analog Interface Kit contains a parts bag that includes two metal set screws and two plastic set screws please follow the rest of instruction 8.

   (a) Remove the set screws from both Analog Procedure Overide Control Knobs and discard these set screws.

   (b) Install one metal set screw from the included parts bag into each control knob.

   (c) Rotate the control shafts fully CCW as viewed from the shaft end and position a knob on each shaft so that the marker line of the knob is in line with the bottom left marker line on the nameplate and tighten the knob set screw.

(d) Install one plastic set screw on top of the metal set screw already in each knob using a moderate installation torque so as not to strip the plastic screw.

(e) Rotate the control knobs to the "0" position.

C. REMOTE ANALOG SIGNALS

1. **Requirements**

The Analog Interface Board of the Analog Interface Kit permits setting of NA-5 volts and wire feed speed procedures by user-supplied external analog signal levels and provides isolation of the kit's control circuitry from these signals. Full range (0 to 100%) linear control over the NA-5 rated volts or wire feed speed setting ranges can be obtained using analog signal levels per the following:

Analog Signal Levels 0 to +10 VDC with ripple content < 50 mV @ ≥ 50 Hz

The following ranges should be observed for best operation:

Volts — 12.0 to 60.0 VDC

Wire Feed Speed

Speedmeter Pin*	Range
45	80 – 978 I.P.M.
57F	40 – 778 I.P.M.
57	38 – 762 I.P.M.
72F	50 – 611 I.P.M.
72	50 – 600 I.P.M.
95S	23 – 456 I.P.M.
95	22 – 428 I.P.M.
142T	15 – 300 I.P.M.
142	15 – 289 I.P.M.

*As appropriate for the NA-5 or NA-5R speedmeter and wire drive being used.

2. **Remote Analog Signal Connections**

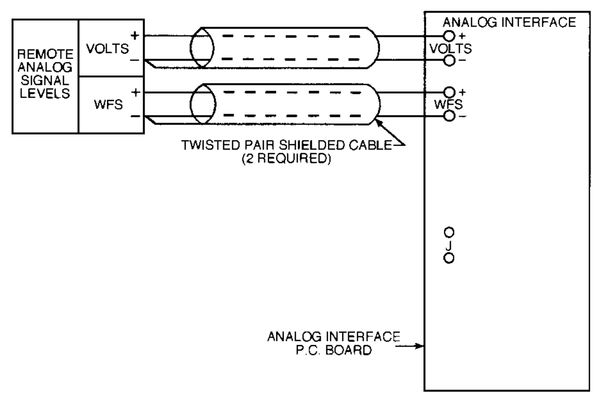
a. Turn off the input power to the NA-5 and remove the Analog Interface Kit side cover panel by removing the two lower panel screws.

b. Use twisted pair shielded cable to connect each analog signal to the Analog Interface Kit. The cable shield should be connected to the (–) signal source as close to (–) lead connection as possible (see connection diagram). These leads should be routed through the cable clamp provided on the Analog Interface Box, or through an appropriate user-provided replacement box connector. **NOTE:** A plug buttoned hole cluster is also provided on later units to accept mounting of an MS3102A-18 type box receptacle, such as L.E. Part No. S12021-11 (4-socket) receptacle for S12020-3 (4-pin) plug with S12024-1 cable clamp.

c. Using .250 x .032 quick-connect female lead terminals, connect the remote leads to the proper Analog Interface Board terminals per the connection diagram.

3. **Selection of NA-5 Front Panel Controls While Welding**

The two "J" quick-connect terminals located at the left center of the Analog Interface Board can be connected together using a jumper lead. This will permit selection of the NA-5 WELD controls by the Idle Mode Switch while welding, as opposed to Idle Mode only selection (as shipped). This allows full range manual procedure control, independent of the Analog signal leads, if ±5% override is not sufficient for some applications.



D. OPERATION

1. **Panel Controls**

a. *Panel Light* — Whenever the Analog Interface light is on the procedure is being controlled by the levels of the 0-10 volt remote analog signals. When the kit is connected to an NA-5R the Analog signal levels will be functional and displayed on NA-5R meters. However, when the kit is connected to an NA-5, they will not be functional nor displayed on NA-5 meters unless the NA-5 WELD mode light is on. When the panel light is off, procedure setting is returned to the NA-5, or NA-5R, controls.

b. *Panel Idle Mode Switch* — The panel idle mode switch allows the selection of NA-5 WELD controls or analog signal levels for procedure settings in the idle mode. This switch will also function while welding if the "J" terminals are connected as described in Section C. The kit's panel light will always indicate the selected weld procedure setting method.

c. *Analog Procedure Override Controls* — These controls are located under the lockable security panel of the Analog Interface Kit. They are used to provide minor changes in remote analog signals (approximately ±5%) in order to find the best welding procedure. Once the proper procedure is determined, the controls should be set to "O" and the remote analog signals readjusted for the correct procedures. These controls are functional and their settings are displayed on the NA-5 meters whenever the front panel light of the Analog Interface Kit is on.

Sec.T2.5.20 (Continued)

2. **Welding With Remote Analog Signal Control**
   a. Set the proper strike procedure using the NA-5 strike mode controls, then set the NA-5 selector switch to WELD mode. **NOTE:** Step (a) is not required when using an NA-5R unit.
   b. Set the Analog Interface Idle Mode selector switch to ANALOG SIGNAL position and the Procedure Override Controls to "O".
   c. Adjust the Remote Analog Signal levels so the NA-5 meters display the desired procedure.
   d. Start the weld, and the welding procedure can be adjusted, or changed, as desired at any time during the weld by changing the Remote Analog Signal levels.

   NOTE: The Kit's Procedure Override Controls may be used for "fine tuning" of the weld procedure, but the controls must be returned to "0" for proper 10 volt for 100% rated range calibration.

3. **Welding with NA-5 Weld Controls**
   a. Connect a jumper to the "J" terminals inside the kit's box (refer to Section C.3).
   b. With the Analog Interface Idle Mode selector switch set to "NA-5" position, the NA-5 operation is the same as if the Analog Interface Control was not installed.
   c. With the Analog Interface Idle Mode selector switch set to "ANALOG SIGNAL" position, the procedure control is returned to the analog signals as described in D.2 above.

E. MAINTENANCE

Every three months, inspect the control box. If needed, blow dirt out using low pressure dry air. No other maintenance should be required.

If the Analog Procedure Override control knobs are removed, the following procedure must be used to maintain proper override control when the knobs are replaced:

1. Rotate control shafts fully CCW as viewed from shaft end.
2. Position knob on shaft so marker line of knob is in line with the bottom left marker line on the nameplate.
3. Tighten the knob set screw.
4. Rotate knob to the "O" position.

F. MAJOR COMPONENTS PARTS LIST

Part	Part No.	Required Per Unit	Spare Parts Recommended for 10 units for 2 Years[1]
Analog Interface P.C. Board Assembly	G1605	1	1
Analog Interface Board Insulation	S17139	1	[2]
Transformer Assembly	S17305	1	1
Idle Mode Selector Switch	T10800-13	1	1
Lead Harness Assembly	S14165-315	1	[2]
Harness Grommet	T9274-3	2	[2]
Control Knob	T10491	2	[2]
Nameplate	M14422	1	[2]
Security Panel	M14287	1	[2]
Lock Tab	T10045-40	1	[2]
Side Cover Panel	S17147	1	[2]

[1] Judgment is required for machine orders for larger quantities. These suggested spare parts are not to be considered as a multiple for each group of 10.
[2] Failure unlikely, replaced only if physically damaged or lost.

SEC. T3.2 — ROUTINE EQUIPMENT OPERATION

Sec. T3.2.1
(File as Sec. L3.2 for IM-278)

Operator's Instructions

WARNING



ELECTRIC SHOCK can kill.

- **Have an electrician install and service this equipment.**
- **Turn the input power off at the fuse box before working on equipment.**
- **Do not touch electrically hot parts.**

Once properly set up (per Sec. T3.4), the operator can make production welds *without readjusting controls* using the following simple instructions.

1. Be sure there is enough electrode in the machine to complete the weld.
2. If submerged arc welding, fill the flux hopper with new or freshly screened flux. All reused flux must be screened 100% through an 8 mesh screen (a .065 – .075 opening). Turn the switch on the hopper to 'On.'
3. Start the power source.
4. Turn the 'Power Control' switch on the wire feeder control to 'On.'
5. Position the welding head at the start of the weld. Be sure the travel carriage or other travel mechanism is set to move in the proper direction.
6. Set the travel switch to 'Automatic Travel.' When set to 'Hand Travel' the travel system operates without welding.
7. For best starts, cut the electrode to a sharp point.
8. Press the 'Inch Down' button to feed the electrode out of the nozzle:
   a. For most applications, when using "hot starting," leave the electrode 1/4" or less away from the work.
   b. When using "cold starting" for some submerged arc welding, inch the electrode down until it touches the work and the flux valve opens.
9. Press the 'Start' button.
10. While welding turn the cross seam adjuster hand wheel as needed to keep the arc in the joint.
11. At the end of the weld, press the 'Stop' button.
12. If needed, press the 'Inch Up' button to get the electrode up out of the way. Remove the work and reload the fixture.

NOTE: When the contact tip in the end of the nozzle wears during repetitive welding, it must be replaced. Check the contact tip for wear if weld quality seems to be deteriorating

February 1982

Sec. T3.2.2
Loading the 50 – 60 Pound Reel

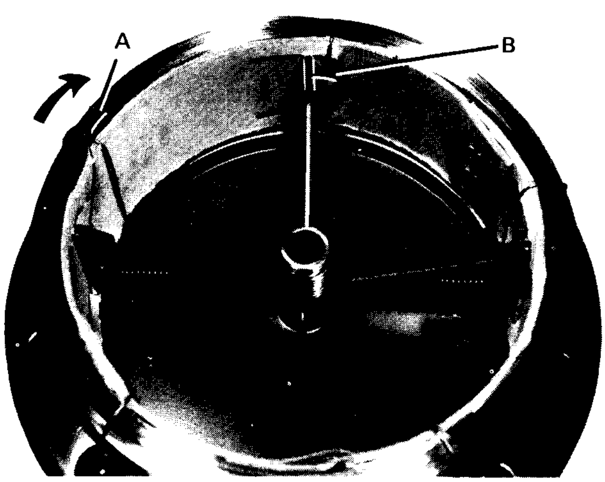
1. To remove the wire reel from its shaft, grasp the spring loaded knob and pull it out. This straightens the knob so it seats into the shaft when released.
2. Lay the reel flat on the floor and remove the cover plate.
3. Place a coil of wire on the reel so it unwinds properly as the reel rotates:
   a. Be sure the coil is placed so the spring loaded arms will not interfere with the later removal of the coil tie wires.
   b. When loading .035 and .045" L-50 wire, be certain the coil is placed on the reel so the spring loaded arms are at the center of the slots in the cardboard coil liner. This provides the positive compression of the coil needed for trouble free wire feeding.
   c. Put the cover plate on the reel so the four arms of the cover straddle the spring loaded arms of the reel proper.
4. Tighten the cover as much as possible by hand. Do NOT hammer on the spinner nut arms.
5. Cut and remove the tie wire holding the free end of the coil. Insert the free end into one of the holes in the cover and secure it by bending it back. Cut and remove the remaining tie wires.

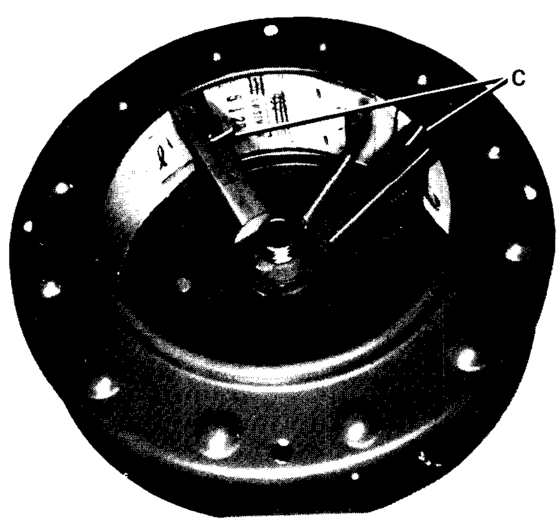
NOTE: Always be sure the free end of the coil is securely held while the tie wires are being cut and until the wire is feeding through the drive rolls. Failure to do this will result in "back lashing" of the coil, which may tangle the wire. A tangled coil will not feed so it must either be untangled or discarded.

6. Replace the reel on the wire feeder. Grasp the shaft knob, pull it out and swing it across the reel hub.
7. Turn the reel until the free end of the electrode is accessible. While tightly holding the electrode, cut off the bent end. **Straighten the first six inches** and insert it through the wire straigthener (or small wire spring guides) to the drive rolls. Press the 'Inch Down' button until the rolls pick up the wire and feed it through the nozzle.

NOTE: When using the flux cored electrode wire straightener, remove the bushing from the top of the straightener. Then insert end of the electrode through the bushing and down through the straightener. When the drive rolls start feeding wire, stop and reinstall the bushing.

February 1982





ROUTINE EQUIPMENT OPERATION – CONT'D

Sec. T3.2.3
(File as Sec. L3.2.3 for IM-278)

Head Position Adjustments

The NA-3N, NA-3S, NA-4, NA-5N and NA-5S heads can be easily adjusted to any welding position. These adjustments are illustrated below. The most frequently used adjustments, Fig. T3.2.3-1 and Fig. T3.2.3-2, are also available on the -NF and -SF units. The other -NF or -SF adjustments depend upon the fixture design.

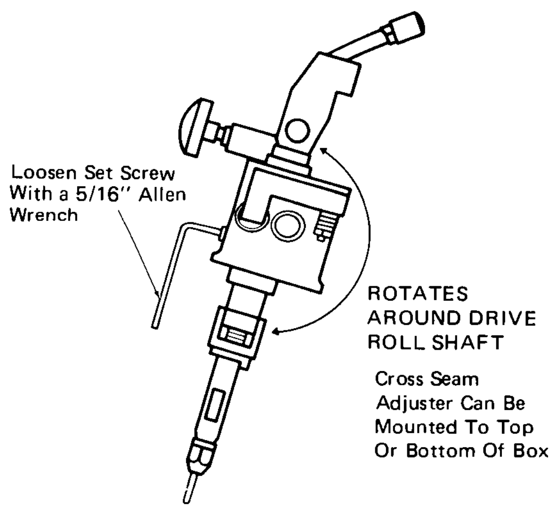


Fig. T3.2.3-1

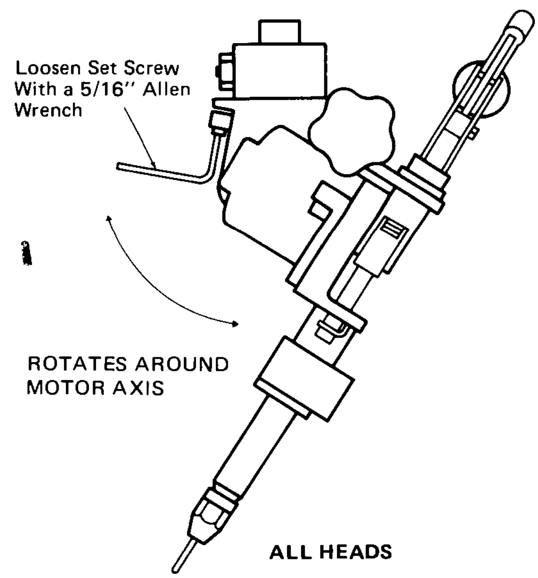


Fig. T3.2.3-2

NOTE: If the head is positioned so the wire feed roll box is placed upside down, the wire straightener and nozzle positions must be interchanged. Then, to feed the electrode down through the nozzle, the wire feed motor direction of rotation must be reversed. To do this interchange leads #626 and #627 from the feed motor plug at the terminal strip inside the control box.

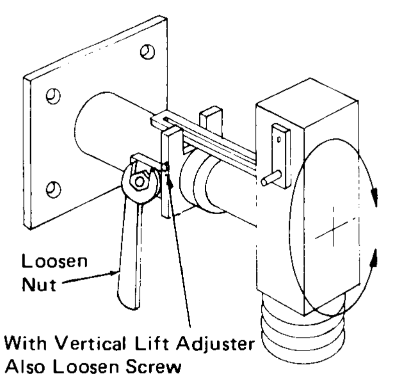


Fig. T3.2.3-3

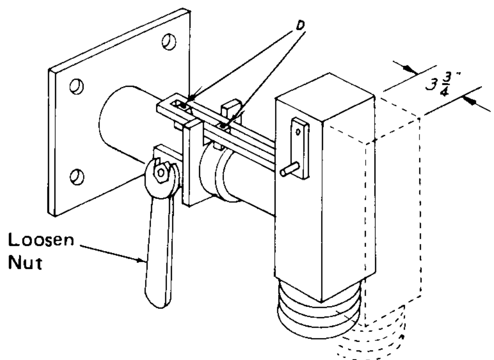


Fig. T3.2.3-4

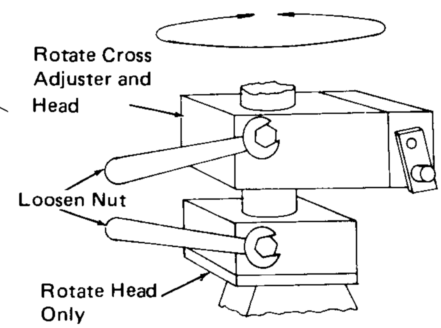
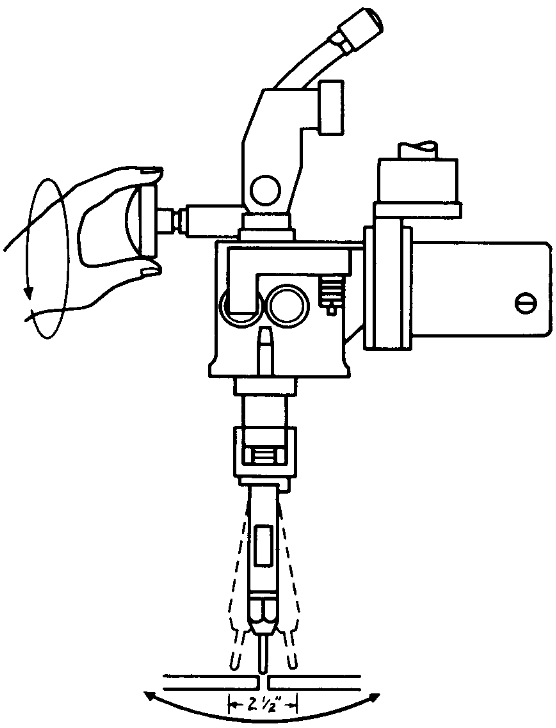


Fig. T3.2.3-5

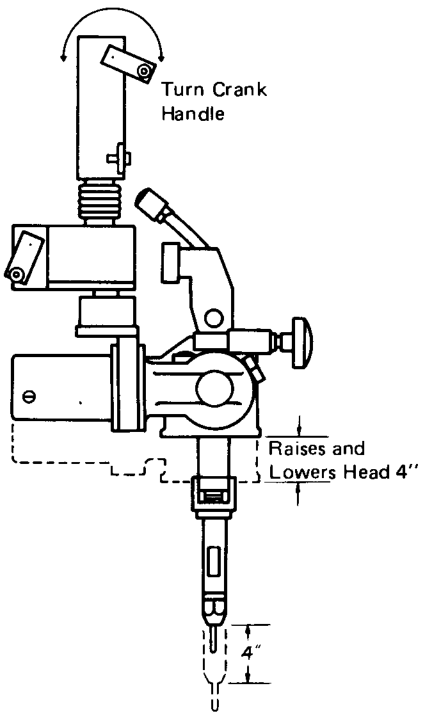
Sec. T3.2.3 and L3.2.3 (Continued)

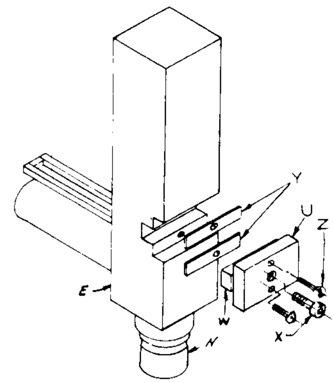


CROSS SEAM ADJUSTER

Fig. T3.2.3-9

Operation of the hand screw of the cross adjustment assembly permits a 2½ inch cross seam adjustment. This adjustment can be done while welding.

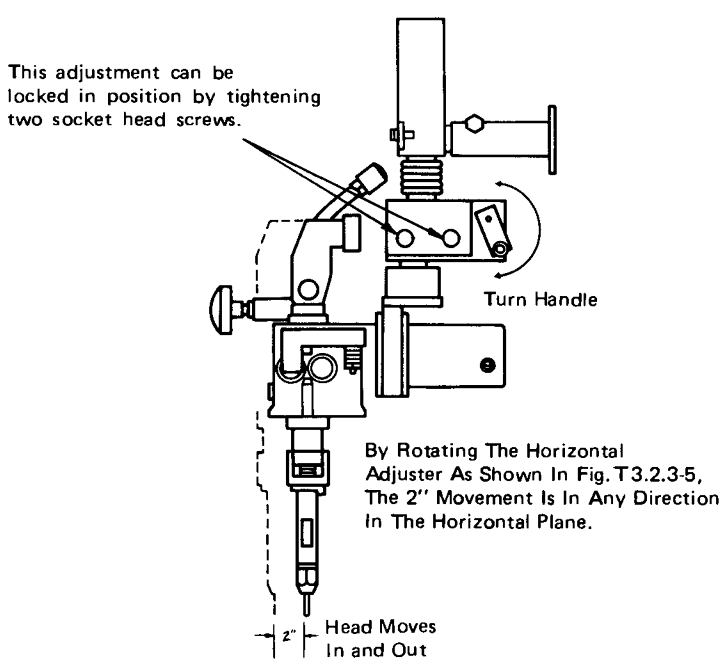




VERTICAL HEAD LIFT ADJUSTER ONLY

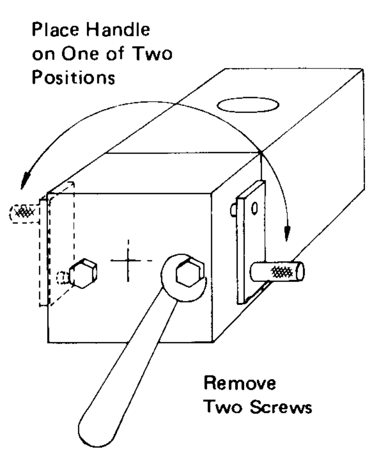
Fig. T3.2.3-6

This adjustment can be used during setup or while welding. To control the rotational movement of (N) as it moves up and down, the key is made in two parts (U) and (W). These parts are spaced by the shims (Y) to allow vertical movement of (N) with the minimum amount of rotational movement when screws (Z) are tight and socket head screw (X) is loose. To lock (N) so there is no movement, tighten socket head screw (X).



HORIZONTAL HEAD ADJUSTER ONLY

Fig. T3.2.6-7



HORIZONTAL HEAD ADJUSTER ONLY

Fig. T3.2.3-8

ROUTINE EQUIPMENT OPERATION – CONT'D

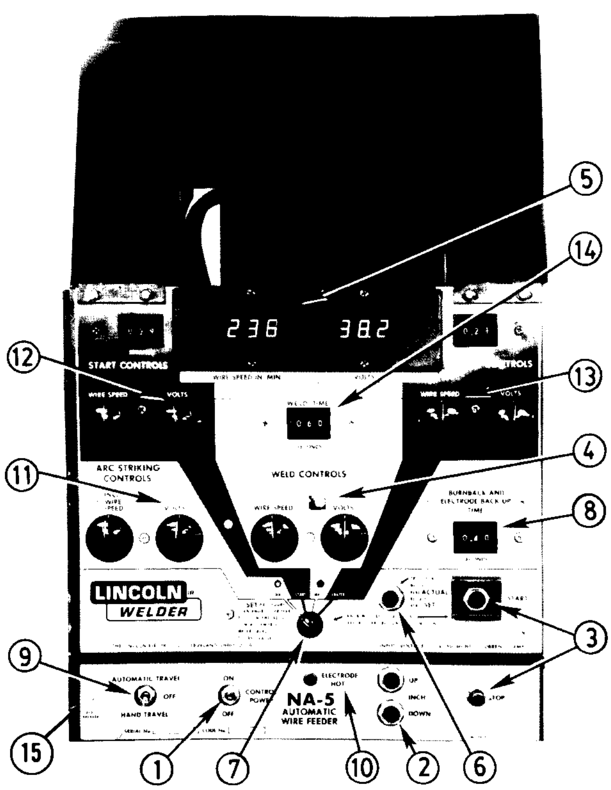
Sec. T3.3.1

Controls and Their Functions

CONTROLS ON THE FRONT OF THE NA-5 CONTROL BOX

A. Exposed Controls (lockable cover down)

1. **Wire Speed Meter (5)** – Reads the SET or ACTUAL wire speed (in inches/minute). The jumper on the meter P.C. board must be properly positioned for the gear ratio and drive rolls being used (see table on wiring diagram).
2. **Volts Meter (5)** – Reads the SET or ACTUAL welding voltage.
3. **Inch-Up Button (2)** – Pushing this button will inch the electrode up.
4. **Inch-Down Button (2)** – Pushing this will inch the electrode down. With NA-5 controls above Code 8300, the electrode will automatically stop when it makes electrical contact with the work, and the flux solenoid (if used) will activate until the inch-down button is released. Units below Code 8300 do not have this automatic stop feature.
5. **Start Button (3)** – When this is pushed, the electrode will feed down with the wire speed and voltage controlled by the Arc Striking Controls.



(Under the conditions noted in Sec. T3.8 (B) under "Electrode Backup", NA-5 Controls above Code 8300 – with "Cold Starting" – may feed in the wrong direction when the start button is pressed.) When the electrode contacts the work, the arc will be established and the circuit will automatically switch from the Arc Striking Controls to the Weld Controls. If the optional Start Control is installed, however, the circuit will switch from the Arc Striking Controls to the Arc Start Controls and then, after the Start Controls time out, will switch to the Weld Controls.

If the circuit is connected (see table on wiring diagram) for starting "on-the-fly", the travel circuit will be energized when the start button is pushed. If the circuit is connected for starting from a standstill, the travel will be energized when the arc is established. (See Sec. T3.5.1.)

6. **Stop Button (3)** – Pressing this begins the stopping cycle. As shipped from the factory, the wire feed motor will stop immediately and there will be a burnback as set by the Burnback and Electrode Backup Time control. However, if the Crater Control option is installed, the unit will first switch from the Weld Control to Crater Control and after the Crater Control Time ends will then go into the stop sequence.
7. **Travel Switch (9)** – When in the Hand Travel position, the travel circuit will be energized. When in the Off position, the travel will not operate and when the switch is in Automatic Travel position the travel will be automatically controlled by the NA-5 control circuit during the welding operation.
8. **Control Power Switch (1)** – This switch opens both sides of the AC input power to the control circuit. In the event of circuit malfunction, this switch can be thrown to the OFF position which will turn the entire circuit off. However, if it is necessary to service the inside of the control box, the power to the box should be disconnected at the power source. Although this switch turns off both sides of the AC line power to the control unit, the power lines and power source control leads are still brought into the control box and, therefore, this power switch should not be relied upon to protect maintenance personnel.
9. **SET-ACTUAL Pushbutton (6)** – After the weld has been started, the ACTUAL wire speed and volts can be read by pressing the pushbutton to the left of the START button. When the pushbutton is not being pressed, the meters read the SET value.
10. **Mode Selector Switch and Lights (7)** – When the NA-5 is at idle, the knob can be set to point to the STRIKE, START, WELD, or CRATER controls for presetting purposes. For example, by turning the knob to WELD, the WIRE SPEED and VOLTS rheostats for the Weld Controls will

Sec. T3.3.1 (Continued)

be operative. With this setting, the WELD light will be on. If the knob is set for optional controls which are not installed, the STRIKE light will be on. After the various controls are set, the knob must be positioned at STRIKE before the start button will function. The important thing to remember is that regardless of the setting of the knob, the light which is on shows the set of controls which are functioning. When welding, the NA-5 control will disable the selector switch and automatically switch the various sets of controls into the circuit and the lights will show which set of controls are operative.

This control can be useful for loading new coils of wire. Usually the Arc Striking inch wire speed is set rather slow. By turning the Mode Selector to one of the other modes, such as Weld, the wire speed is set to the higher speed as set by the Weld wire speed. After wire is loaded, the Mode Switch is set back to Strike.

11. **Electrode 'HOT' Light (10)** – This light comes on when the start button is pressed and the electrode circuit is electrically hot. It will stay on until the control signals the power source output to be off.
12. **Circuit Breaker (15)** – Protects the circuit from severe wire feed overloads or short circuit conditions.

B. Controls Under the Lockable Security Cover

1. **Arc Striking Controls (11)** – There are two controls in this mode. The Inch Wire Speed rheostat sets the wire speed during idle and after the NA-5 is energized by the Start circuit until welding current begins to flow. The Volts potentiometer controls the power source output voltage before the arc strikes. (The Volts potentiometer is not effective on R3S machines.) Proper setting of both of these controls is very important in order to have the best arc striking.
2. **Weld Controls (4)** – The Wire Speed and Volts potentiometers control the welding procedure.
3. **Burnback and Electrode Back Up Time (8)** – This control determines the length of time of burnback delay after the stop circuit is energized. Depending on the connections on the logic board, it may also determine the length of time the wire feed motor reverses after the stop button is pushed before it stops. The NA-5 as shipped from the factory is connected to stop the wire feed motor immediately with adjustable burnback delay when the stop button is pushed. The time delay control, therefore, should be adjusted to just the point where there is no sticking of the electrode in the crater at the end of the weld. If the circuit is connected so the wire reverses at the end of the weld, the distance the wire reverses after the welding arc goes out is controlled by the time setting and the Inch Wire Speed. The higher the Inch Wire Speed setting, the faster the wire reverses. If the wire does not back up far enough at the end of the weld, increase the time setting and/or turn the Inch Wire Speed to a higher setting. However, the inch speed should be set for best arc striking and the backup distance controlled by the time setting. If other modes of burnback and electrode backup are desired, refer to Sec. T3.5.2.

   Burnback voltage and wire speed will be at the settings of the previous mode until the arc goes out.
4. **Start Controls (12) (Optional)** – On some applications and procedures it is desirable to weld at a different wire speed and voltage at the start of a weld for a short period of time before swiching to the weld wire speed and volts. When the optional Start Controls are installed this can be done. The start wire speed and voltage can be higher or lower than the weld values and are completely independent of other control settings. Setting the start time to 0.00 seconds will bypass the start mode controls during the welding cycle.

   Install the optional Start Controls per the instructions included with the kit. Note that the same kit can be used for either Start Controls or Crater Controls and proper function depends on correct installation.

   Although the timer can be set for 9.99 seconds, the majority of applications will require only 0.25 to 2.00 seconds. A good rule to follow for the initial settings of the Start Controls is to set them at the same settings as the Weld Controls wire speed and voltage. The time delay can be set for about one second. After the first test weld, the controls can be re-adjusted as desired.
5. **Weld Timer (14) (Optional)** – With this option, the weld duration is set by the Weld Time control. The control starts timing when the Weld Controls become operative and energizes the stop circuit when it reaches its set time. Install the optional Weld Timer module per the instructions included with the kit. Setting the weld time for zero seconds will bypass the weld mode control settings during the welding cycle.
6. **Crater Controls (13) (Optional)** – On some applications and procedures it is desirable to weld at a different wire speed and voltage at the finish of a weld for a short period of time for crater filling purposes. The optional Crater Controls has been designed for this purpose and allows higher or lower values than when welding. Setting the Crater time to 0.00 seconds will give zero crater-fill time; however, the crater settings will be active during Burnback time until the arc goes out.

   Install the optional Crater Controls per the instructions included with the kit. Note that the same

Sec. T3.3.1 (Continued)

kit can be used for either Start Controls or Crater Controls and proper function depends on correct installation.

Although the timer can be set for 9.99 seconds, the majority of applications will require only 0.25 to 2.00 seconds. A good rule to follow for the initial settings of the Crater Controls is to set them at the same settings as the Weld Controls wire speed and voltage. The time delay can be set for about one second. After the first test weld, the controls can then be readjusted as desired.

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SEC. T3.4 — SET-UP INSTRUCTIONS

⚠WARNING



ELECTRIC SHOCK can kill.

- **Have an electrician install and service this equipment.**
- **Turn the input power off at the fuse box before working on equipment.**
- **Do not touch electrically hot parts.**

1. If using a multiprocess power source (SAM, SAF, SA, DC-400, DC-600, DC-1000 or DC-1500 type), make connections and settings per the power source connection diagram for the process being used. See Sec.T2.3.4.

   AUTO TAB
   When using the NA-5 with a DC-400 power source, the "Auto Tab" jumper on the NA5 voltage P.C. board must be connected in order for the inch down circuit to function. When the "Auto Tab" jumper is connected, the Cold Starting feature of the NA5 is disabled, and only the Hot Starting technique can be used. If the Cold Starting technique is to be used, the optional K826 Diode Kit must be installed on the DC-400.

2. Set the power source and NA-5 circuit polarity per information on Electrode Polarity in Sec. T2.3.

3. Depending upon the procedures and applications, decide:

   a. The means of arc striking and whether to start the travel with the 'Start' button or the arc.
   b. Whether the initial bead size or penetration requires use of the optional Start Controls.

   See Sec. T3.5 for descriptions of these various starting sequences and the rewiring needed to accomplish them.

4. Depending upon the procedures and applications:

   a. Select the arc and travel stopping sequence. See Sec. T3.5.2 for a description of these various stopping sequences and the rewiring needed to accomplish them.
   b. Decide if control of the ending bead size or crater filling requires use of optional Crater Controls. See Sec. T3.5.2.

5. Set the head position relative to the work as required for the fixture, application, and procedures. See Sec. T3.2.3.

6. Rotate the wire straightener, if used, until the top of the straightener faces the wire reel. This is required for smooth feeding of the electrode into the straightener.

7. Refer to the instructions for the wire contact assembly being used. See Sec. T2.2.6, T2.2.7, T2.5.3 or T2.5.4.

8. The mount for standard 50 and 60 pound electrode coils includes a two-position brake assembly. Generally the brake should be at the inner position (nearest to the wire reel shaft) for wire feed speeds below 400"/min. It should be at the outer position for faster wire speeds. To adjust the brake position, remove the wire reel. Pull the cotter pin that holds the brake shoe to the arm, move the shoe, and replace the cotter pin. Do not bend the cotter pin – it is held in place by a friction fit.

9. Load the wire reel per Section T3.2.2 or install the Speed-Feed drum or reel per Section T2.5.7-A or -B.

10. Straighten the first six inches of electrode and push it through the wire straightener to the drive rolls. To use the cored wire straightener, remove the knurled nut at the top, feed the wire through the nut, down into the straightener, and into the drive rolls. Screw the nut back onto the straightener. Feed wire through the nozzle tip and adjust the straightener for optimum straightness. With wire contact assemblies, except the K231, adjust until the electrode is straight as it comes out of the nozzle. Do not completely straighten the wire when using a K231 contact nozzle because the nozzle relies on a small curvature of the electrode for proper electrical contact within the contact tip.

11. Set the travel speed as specified by the procedures. With the wire feeder travel switch set to 'Hand Travel', the travel runs without welding permitting accurate measurement of travel speed. When using a Lincoln travel carriage, adjust the speed with the rheostat and the direction with the toggle switch on the carriage control panel.

12. Connect the work lead to the work or a suitable piece of scrap. Clip the end of the electrode to a sharp point.

13. Preset the Start (if used), Weld, and Crater (if used) Controls to the wire speed and voltage specified in the procedure.

14. Make several test welds, readjusting the controls in the following order:

    a. Set the Arc Striking, Inch Wire Speed, and Volts Controls for optimum arc striking. The optimum strike control settings for most processes will be typically 4 - 5 volts higher than the Weld Mode Voltage Setting and 40 - 50% of the Weld Mode Wire Feed Speed Setting (possibly lower if cold starting is used).
    b. If striking is still not satisfactory, refer to Sec. T3.5.2 for information on wire feed motor acceleration.
    c. If installed, adjust the "Start Controls" to set the welding procedures for the time set on the timer to provide the bead size, penetration, or other factor as needed for the application (refer to Sec.T3.5.1).

Sec.T3.4 (Continued)
Setup Instructions

d. If installed, adjust the "Crater Controls" to set the welding procedures for the set time after the stop button is pressed to provide the bead size or fill the crater as needed for the application (refer to Sec. T3.2.2).
e. Set the "Burnback Time" to provide the stopping characteristics needed.

SEC. T3.5 – STARTING AND STOPPING SEQUENCES

Sec. T3.5.1
Means of Arc Striking

A. **All NA-5 codes utilize "hot start" arc striking which operates as follows:**

1. With the electrode not touching the work, press the 'Start' button.
2. The electrically "hot" electrode inches down as set by the 'Inch Wire Speed' control.
3. When it makes electrical contact with the work, the arc strikes and the circuit automatically switches from 'Strike' settings to 'Weld' (or Start, if used) settings.

B. **NA-5 models above Code 8300 offer both "hot start" arc striking, as described above, or "cold start" arc striking which operates as follows:**

1. Press the Inch Down button until the tip of the electrode touches the work, automatically stops, and the flux (if used) is automatically dispensed. **NOTE:** If Inch Speed is set too high, the electrode may stop with too much force on its tip resulting in possibly poor starting.
2. The arc establishes when the 'Start' button is pressed and the circuit automatically switches to Weld (or start, if used) settings. Should the arc not start immediately, the wire will retract slightly until the arc is established and then feed down in the normal manner.

Use either the standard "on-the-fly" travel starting or rewire the controls for "standstill" travel starting per Sec. T3.5.2 below.

C. **Optional 'Start Controls'**

Recommended for applications where penetration, bead size, and other weld characteristics must be carefully controlled at the start.

The starting sequence is as described above except, when the arc strikes, the machine welds at the wire speed and voltage set by the 'Start Controls' panel until the time set on the thumbwheel switch elapses. The circuit then automatically switches to 'Weld Controls' wire speed and voltage. Actual settings depend upon the application requirements.

Setting the start time to 0.00 seconds will bypass the Start Mode controls durng the weld cycle.

D. **Available options for applications with particularly difficult starting**

1. K238 High Frequency Generator – See Sec. T2.5.8.
2. K237 Linc-Fill Starting Relay – See Sec. T2.5.12.

Sec. T3.5.2
Setting Travel Starting and Stopping

Standard machines can be connected for a variety of starting and stopping sequences.

STARTING SEQUENCES

A. **"On-the-Fly" Travel Starting**

When shipped, all models are connected for "On-the-Fly" travel starting. The sequence follows:

1. With the electrode NOT touching the work, press the 'Start' button. This starts both the wire feed and travel motors.
2. When the electrically "hot" electrode touches the work to start the arc, there is relative motion between the end of the electrode and the work. This "scratching" type contact helps assure consistent arc striking.

This sequence is recommended for most welding, including:

1. **Roundabouts and any other weld which ends at its starting point. A K337 Weld Timer Module to control the welding cycle duration can be installed.**
2. **Welds started on a run-out tab.**
3. **For improved arc striking on any application.**

B. **"Standstill" Travel Starting**

All models can be reconnected so the travel remains at a standstill until the arc starts. "Standstill" travel starting is used when the electrode must be started at a precise location.

For consistent arc striking with "Standstill" travel starting, always clip the end of the electrode to a sharp point before starting.

C. **Stopping Sequences**

As shipped, the travel stops when the 'Stop' button is pressed producing a smaller crater area.

When the end overlaps the beginning of the weld, reconnecting to stop the travel later in the sequence spreads the crater over a longer area.

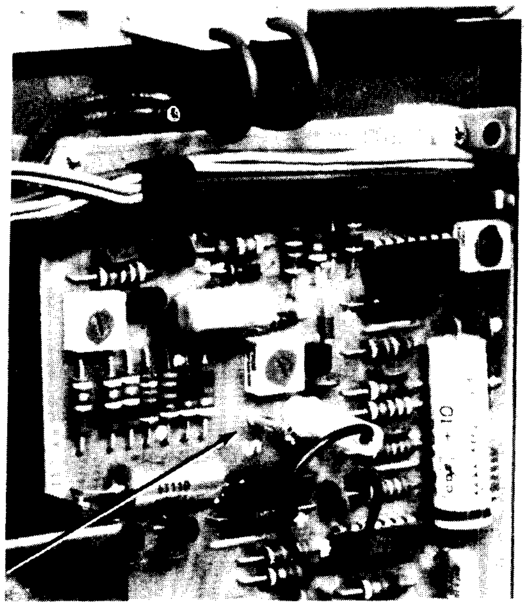
D. **Reconnecting the Travel Starting and/or Stopping Sequence**

To change the travel sequence, turn off all input power to the NA-5 control box. Open the control box. The logic board is mounted on the back of the box in the upper right hand corner. To change the travel circuit for the various modes of starting and stopping, follow the information on the table of the wiring diagram for the NA-5 being used. Table T.3.5 at the end of this seciton also shows information on reconfiguring the travel sequences.

E. **Wire Feed Motor Acceleration**

The NA-5 has two different speeds of controlled wire feed motor acceleration. As shipped, the unit is connected for fast acceleration which is best for most ap-

Sec. T3.5.2 (Continued)



plications. To change to the slower acceleration, turn off all input power to the NA-5 control box. Open the control box. Locate the 'Control' P.C. Board mounted on the back of the box in the lower right hand corner and change the jumper plug from the 'F' pin to the 'S' pin.

F. Burnback and Electrode Back-Up

The primary consideration in setting the arc stopping sequence is to prevent the electrode from sticking in the puddle. This is easily done with the machine as shipped. The standard sequence when the optional 'Crater Controls' are not used follows:

1. Press the 'Stop' button.
2. The wire feed motor stops and the Burnback time delay starts.
3. The arc continues to burn the electrode back from the puddle until the arc goes out or the time set on the thumbwheel switch elapses. This control should be set for just enough burnback time to prevent crater sticking.

There are two other ways this circuit can be connected. One will cause the wire to retract* with a contactor drop out delay at the end of the weld, and the second will cause the wire to retract* during burnback time and there will be no contactor drop out delay at the end of the weld. If either one of these alternate methods of stopping the weld is desired, the connections on the logic board can be easily changed.

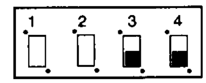
To change the stopping sequence, turn the input AC power off at the power source, remove the screw holding the inner panel and swing the panel open. Change the connections (older models) or switch positions (newer models) on the logic board as follows:

WHEN THE "STOP" BUTTON IS PRESSED:

1. Feed motor stops and electrode burns back with contactor delay (standard)

For older models
lead 693 to pin 3
lead 690 to pin 4

For newer models‡

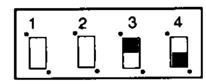


Switch #2

2. Feed motor inches up and electrode burns back with contactor delay

For older models
lead 693 to pin 1
lead 690 to pin 4

For newer models‡

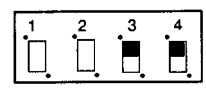


Switch #2

3. Feed motor inches up and contactor opens (no burnback)

For older models
lead 693 to pin 1
lead 690 to pin 2

For newer models‡



Switch #2

G. Optional 'Crater Controls'

Recommended for applications where the ending bead size must be controlled, the crater must be filled, including roundabouts, and other welds where the end overlaps the start.

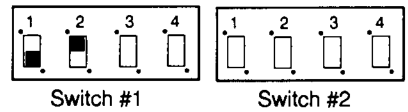
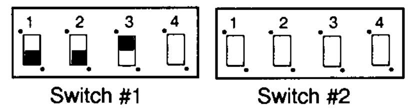
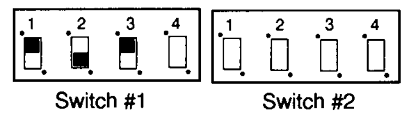
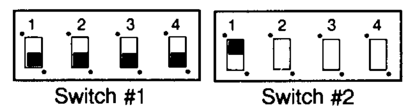
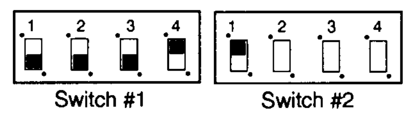
When the 'Stop' button is pressed, the machine welds at the wire speed and voltage set by the 'Crater Controls' until the time set on the thumbwheel switch elapses. The circuit then automatically switches to the arc stopping sequence described above.

NOTE: Setting crater time to 0.00 seconds will give zero crater fill time; however, the crater settings will be active during burnback time until the arc goes out.

* Wire will retract at Weld Mode Speed (or Crater Mode Speed, if installed) until the arc goes out, then retract at Strike Mode Speed for remainder of burnback time.

Sec. T3.5.2 (Continued)

Table T.3.5 RECONNECTING THE TRAVEL SEQUENCE

Travel Starts	Travel Stops	Older Models	Newer Models†
With the "Start" Button	With the "Stop" Button	Lead 691 to Pin 6 Lead 692 to Pin 5	
With Arc Striking	With Arc Stopping	Lead 691 to Pin 6 Lead 692 to Pin 7	
With Arc Striking	With "Stop" Button	Lead 691 to Pin 5 Lead 692 to Pin 7	
With "Start" Button	With End Crater Fill Time (with Optional procedure module installed in crater receptacle[1])	Lead 691 to Pin 6 Lead 692 to Pin 9	
With "Start" Button	After Burnback Time (with Optional procedure module installed in crater receptacle[1])	Lead 691 to Pin 6 Lead 692 to Pin 8	

†NOTE:

Indicates switch in up ↑ position

Indicates switch in down ↓ position

Indicates switch position does not matter

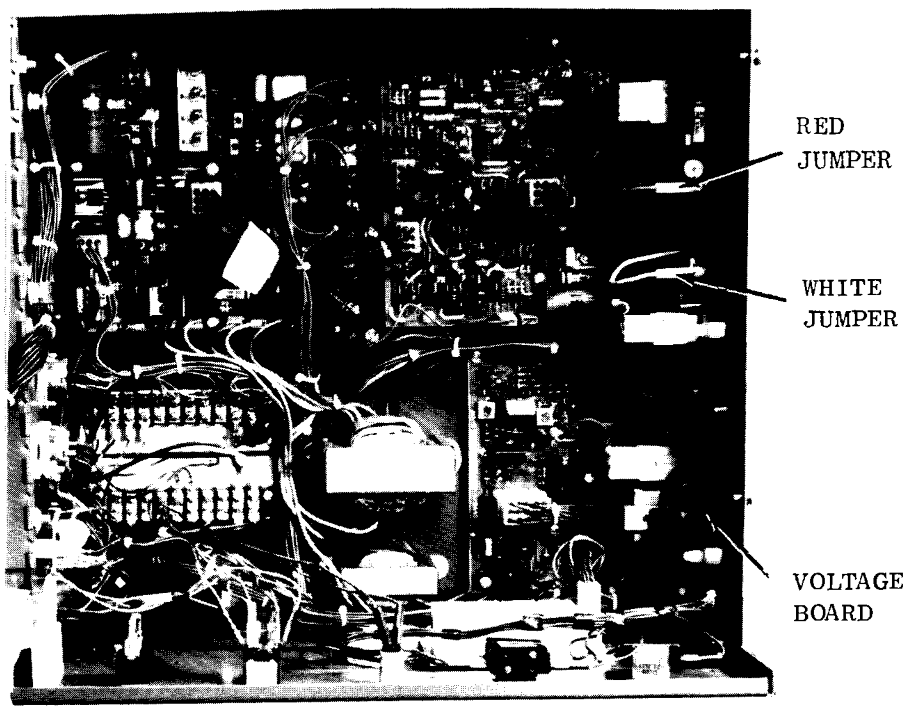
[1] If the Optional Procedure Module is installed in the crater receptacle, DIP switch position 1 on Switch #2 should be in the UP position as shown. Additionally, remove 583C to 584C Jumper Plug from the Procedure Board. If the Procedure Module is not installed the switch should be in the down position and the 583C to 584C Jumper Plug should be re-installed on the Procedure Board.

SEC. T3.6 – VOLTAGE CONTROL RESPONSE

The NA-5 is provided with selectable voltage control response. Proper setting depends on the power source and process being used. Refer to the appropriate power source connection diagram for the proper connection of the jumpers located on the NA-5 Voltage Board.

To change the voltage control response:

1. Turn off all input power to the NA-5 control.
2. Open the control box.
3. Locate the Voltage P.C. board mounted on the right side of the box. Position the jumper plugs on the Voltage Board per the appropriate power source connection diagram.



SEC. T3.7 – AUTOMATIC SHUTDOWN

If the NA-5 voltage control is unable to supply the 'SET' value of arc voltage while welding, the automatic shutdown circuit will activate. This protection circuit immediately returns the NA-5 control to idle state within a few seconds after the arc voltage discrepancy occurs.

Typical causes for the activation of this protective shutdown circuit are as follows:

1. 'SET' value of arc voltage is outside the power source range.
2. Power source voltage control not set for 'REMOTE'.
3. Misconnection of NA-5 control cable leads to power source.
4. Incorrect weld polarity connections, or settings, at NA-5 or power source.
5. Lost connection of NA-5 voltage sensing leads (#67 and #21) between arc and voltage control, or a blown ⅛ amp fuse on voltage P.C. boards built since 1983.

With NA-5 units above Code 8300, the conditions of (4) and (5) above would result in the wrong wire feed direction when the weld is started. (See Sec. T3.8.)

In the case of full range control power sources, such as the DC-600, this protective shutdown circuit could prevent welding under the conditions of (3), (4) and (5) above by holding the power source output at minimum, possibly providing too low of a power source output to even establish an arc, or causing the field fuse to blow because of rapid field reversals with NA-5 controls above Code 8300. (See Sec. T3.8.)

Although out of range shutdown can occur with all power sources when working with very low or very high arc voltages, it is most likely to occur when using the R3S models with the somewhat limited voltage range of the various taps. For instance, if the R3S-400 triangle tap setting is for 31 volts, the range of control from the remote circuit is approximately 7 volts, i.e., 27½ to 34½ volts at nominal input voltage. If the NA-5 controls are set for 29 volts and the input voltage to the R3S goes up, it may not be possible for the NA-5 control circuit to hold the 29 volts so the welding will shut down. By changing to the 27 volt triangle setting, the range will be approximately 23½ to 30½ volts and at high input voltage there will be sufficient control to hold the SET arc voltage. On these machines, if the NA-5 stops welding, follow this procedure:

A. Move the NA-5 voltage set point 2 volts lower than the desired procedure and make a test weld.
    1. If the NA-5 still shuts down, go to Step (B) below.
    2. If the NA-5 keeps welding, change the R3S triangle setting to the next *higher* voltage and reset the NA-5 set point to the desired procedure. The R3S is now set properly unless there is a significant change in input voltage. Skip the following step.

B. Move the NA-5 voltage set point 2 volts higher than the desired procedure and make a test weld.
    1. If the NA-5 now keeps welding, change the R3S triangle setting to the next *lower* voltage and reset the NA-5 set point to the desired procedure. The R3S is now set properly unless there is a significant change in input voltage.
    2. If the NA-5 still shuts down, refer to the following paragraph and the other possible causes previously listed.

In some cases, it is also possible to hold the 'ACTUAL' button pressed while starting the arc. Before the NA-5 shuts down, the actual arc voltage can be read on the digital meter. Comparing this reading to the 'SET' reading will tell what change in the range controls of the power source are required so it can supply the desired voltage. Should the meter read zero, check the NA-5 sensing leads (#21 and #67) connections. Should the meter read a minus (−) voltage, the polarity connections or settings at the NA-5 or power source are wrong.

This same general procedure can be used on other power sources. For example, if the NA-5 keeps shutting down and the other possible causes have been checked, adjust the SET voltage higher and/or lower than the desired voltage. If the NA-5 continues to weld at one of these voltages, it can then be determined what change in the range controls of the power source are required so it can supply the desired voltage.

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SEC. T3.8 – COLD START CIRCUITRY

NA-5 controls above Code 8300 contain circuitry added to the Voltage P.C. board to facilitate the "cold starting" features of these units.* This circuitry senses the voltage present between the electrode and work, via leads #67 and #21, and permits normal wire feed if this voltage exceeds typically about 6.5 volts DC. However, if this voltage level is not exceeded, or drops below typically about 3.5 volts DC, the Auto Stop activates while inching down or electrode backup occurs if the arc start circuit has been initiated.

* Units below Code 8300 can be provided with the cold start circuitry by replacing the old code L-6257 Voltage board with the new G-1556 Voltage board. This new board will mount and connect in the same manner as the old board, except the third harness connector (previously connected to a jumper plug) must be connected to the lower receptacle of the new Voltage board.

NOTE: HI-FREQ starting cannot be used with converted units *below* Code 8300.

A. Auto Stop

When the inch down button is pressed, a low level DC voltage signal is applied between the electrode and work which permits the wire to inch down normally. When the electrode makes electrical contact with the work, it shorts out this signal causing the wire feed to automatically stop and the flux solenoid to activate until the inch down button is released. Inch up will not be affected by this circuit.

This voltage signal is supplied by the 24 volt transformer on the NA-5 Voltage P.C. board only when the inch down button is pressed. The level of the signal appearing between the electrode and work will be dependent on the impedance present across these points, including the power source output stud impedance. If this impedance is less than 500 ohms the applied signal level may be too low to permit the electrode to inch down.

B. Electrode Backup

If while starting or welding the electrode stubs or shorts to work, the resulting loss of arc voltage will cause the electrode to momentarily back up until the arc voltage is re-established, then change back to normal feed direction.

NOTE: The "cold starting" circuitry will cause the NA-5 to feed in the wrong direction when the start button is pressed if the 'ACTUAL' arc voltage, as read on the NA-5 voltmeter, does not exceed typically about 6.5 volts. Usual causes for this situation are:

1. No wire loaded through the NA-5 head and nozzle assembly (*except* when using the K148 nozzle).
2. No power source weld cable connection to the NA-5 head or work.
3. Incorrect electrode polarity connections at the NA-5 or power source.
4. Little or no output voltage from the power source.
5. An open #67 or #21 voltage sensing lead to the NA-5 control box, or a blown 1/8 amp fuse on voltage P.C. boards built since 1983.

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SEC. T3.9 – SECURITY OF WELD PROCEDURE SETTINGS

There are two means provided to prevent or limit unauthorized readjustment of the NA-5 voltage and wire feed speed controls once set to the desired procedure.

1. The security panel of the NA-5 can be locked to prevent access to the control knobs.
2. The control range of the procedure control knobs can be limited to either about 3% or about 15% of the full range control by installing a knob rotation stop screw to any or all of the control knobs. This stop screw is installed in the following manner:
   a. Turn off the input power to the NA-5.
   b. Loosen each knob set screw and remove all knobs, including the rotary selector switch knob.
   c. Remove the felt seal and square spacer tube mounted behind each control knob.
   d. Open the control box and disconnect, then remove, the procedure control P.C. board assembly and its panel insulation.
   e. Install a ½" long, pan or round head, #4 sheet metal screw into the .10" dia. hole, located beneath each square hole, so the head is on the back side of the panel (inside the control box).
   f. Remount the P.C. board assembly and its panel insulation, then reconnect the P.C. board and close and secure the control box.
   g. Remount the rotary selector switch knob, and replace each square spacer tube and felt seal so the #4 screw protrudes between the tube and the felt seal.
   h. Turn on the NA-5 input power and set the desired procedure by rotating the shafts of the controls.
   i. Carefully replace each control knob so the #4 screw inserts into the center of the shorter length channel on the back of the knob for about 3% of the total range of control or into the center of the longer length channel for about 15% of the total range of control.
   j. With finger pressure on the knob against the felt seal, carefully retighten the set screw of each knob.

NOTE: Steps (h) thru (j) will have to be repeated if it is desired to change the procedure settings to values outside the selected 3% or 15% control range limit.

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SEC. T6 – MAINTENANCE

Sec. T6.2 – Mechanical Maintenance

⚠WARNING



ELECTRIC SHOCK can kill.

- **Have an electrician install and service this equipment.**
- **Turn the input power off at the fuse box before working on equipment.**
- **Do not touch electrically hot parts.**

Sec. T6.2.1
Wire Drive Gearbox

Once a year recoat all gears with a non-fluid type lubricant (Lincoln Spec. E2322). For access to the gears in one chamber, remove the adapter plate and motor assembly. To lubricate the gears in the other chamber, remove one of the pipe plugs and feed grease in contact with the bevel gear teeth while rotating the output shaft until all teeth are lubricated.

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Sec.T6.2.2
Changing Wire Size and Wire Feed Gear Ratios

Gear Ratio	Feed Speed Range (in/mm)	Max. Wire Size	
		Cored Wire	Solid Wire
21:1	100 - 2070	.052	.052
57:1	38 - 762	3/32	1/16
95:1	22 - 428	5/32	1/8
142:1	15 - 289	5/32	7/32

Four wire size conversion kits are available to convert wire feeder for different size or type electrodes. The kits include drive rolls and guide tubes for the wire specified:

3/32 – 7/32 Solid or Cored	T13724-A
1/16 – 3/32 Solid or Cored	T13724-B
.035 – .052 Solid	T13724-C
.045 – .052 Cored	T13724-D

To have proper wire speed calibration, the proper combinations must be used. See section F.5, or NA-5 wiring diagram for proper pin settings on the wire speed meter PC board.

Four gear ratios are available — 21:1, 57:1, 95:1 and 142:1. To change the gear ratio, replace the motor pinion and the first reduction gear per the following instructions: (Refer to P-100-C and P-135-C.)

1. Remove the four round head screws which mount the motor adapter plate to the gearbox. Remove the motor and adapter plate from the gearbox.
2. Take the two longer screws removed in Step (a) and screw one into each of the tapped holes located in the face of the fiber input gear (Item 13). Insert the screws through the full thickness of the gear and, using a screwdriver wedged between the screws to prevent rotation, remove the hex nut (Item 10) which holds the gear to the shaft. Remove the flat washer (Item 11).
3. Pull the gear from the shaft using the screws as a pulling device.
4. Be certain the woodruff key (Item 5) is properly located on the shaft. Turn the adapter plate mounting screws into the new fiber gear from the stenciled side and place the gear on the shaft. Replace the flat washer, tighten the hex nut, and remove the adapter plate mounting screws from the gear.
5. After noting the relation of the adapter plate with the motor leads, remove the adapter plate from the motor. Support the pinion properly and, with the proper size punch, drive the roll pin which holds the pinion out of the shaft. Pull the pinion off. Install the new pinion and replace the roll pin. Replace the adapter plate in its original location.
6. Cover the teeth of the motor pinion and the input gear with a non-fluid type lubricant (Lincoln Spec. E2322). This can be scooped from the cavity of the gear case.
7. Reassemble the motor on the gearbox being certain the gears mesh properly and the adapter plate locating bead is in its cavity. Replace and tighten the four screws and the lockwashers removed in Step (1).
8. Jumper on wire speed meter P.C. board must be properly positioned for the gear ratio and drive rolls being used. (See table on wiring diagram.)

July 1983

Sec. T6.2.3
Wire Drive Mechanism

Drive mechanisms for three wire size ranges are available - .035 thru .052", 1/16 thru 3/32" and 3/32 thru 7/32". If changing to wire sizes outside the range, change the drive rolls and the incoming and outgoing guide tubes. Also change the gear ratio (Sec. T6.2.2) if necessary.

The electrode is driven by gripping between the grooved drive rolls and a spring loaded idle roll. Replace the drive rolls when they become worn. The drive rolls for .045 – .052 cored electrode 1/16" and larger diameter electrodes have two sets of teeth so they can be reversed once before they must be replaced.

February 1982

Sec. T6.2.4
Wire Straighteners

1. **For Solid Electrode**

   Periodically inspect the slide bushing at the top of the straightener and the ingoing wire guide at the bottom of the straightener for signs of wire milling. If necessary, rotate the guide to present an unworn surface. To reverse the slide bushing for a fresh wear surface, remove the cross adjustment screw and turn the bushing over.

Sec.T6.2.4 (Continued)

2. For Flux Cored Electrode

Severe wear to the ''V'' groove in the curved arm of the straightener can result in wire wander at the arc. Periodically check the groove and replace the arm when badly worn. Also replace the ingoing guide at the top of the straightener if it shows signs of milling the wire.

February 1982

SEC. T6.3 - ELECTRICAL MAINTENANCE

Sec. T6.3.1
Control Box

Every three months inspect the control box. If needed, blow dirt out using low pressure air. No other maintenance should be required.

February 1982

Sec. T6.3.2
Circuit Protection

The circuit breaker mounted at the bottom left hand corner of the control box protects the control circuit from short circuit conditions and from severe wire feed overloads. If it opens, determine and correct the cause of the overload. To reset the circuit breaker, push the button.

If a complete or partial short occurs in the field circuit or if there is a defect on the Power P.C. board, a 1/2 amp slow-blow type fuse will blow on early model machines, or a PTC Resettable Fuse will open on later model machines. This field circuit protection is mounted on the Power P.C. board inside the control box. Before replacing the fuse or allowing the PTC Resettable Fuse to reset and restoring power to the machine, check the motor field for a shorted condition. Normal field resistance is approximately 700 ohms.

With NA-5 controls above Code 8300, the field circuit protection may also open due to frequent motor field reversals from application problems affecting the "cold" starting circuit, such as the power source output being too low to establish an arc, or the welding procedure causing frequent electrode-to-puddle shorting. (Refer to Sec. T3.7.)

The power supply for the electronic circuitry is protected by a 1/2 ampere slow-blow type fuse. It is located on the Power P.C. board inside the control box.

The 1/8 amp fast-blow fuse, on the Voltage P.C. boards built since 1983, protects the NA-5 circuitry from damage which may result from a ground, or case, faulted control lead. If this fuse blows, the NA-5 arc voltage sensing lead circuit will be opened (see Section T3.7), and the NA-5 Troubleshooting Guide should be consulted to detect and clear the fault.

September 1998

Sec. T6.3.3
Ground Fault Fuse Protection

A 1/8 amp fast-blow fuse is located on the NA-5 Voltage board. This fuse will protect the NA-5 circuitry from damage resulting from a ground, or case faulted control lead when arc voltage potential exists between ground and the NA-5 circuit common (#510). Such a condition typically exists when the NA-5 polarity connections are set for electrode negative.

April 1988

SEC. T6.4 – OPTIONAL FEATURE MAINTENANCE

Sec. T6.4.1

Wire Contact Assemblies

Dirty or rusty electrode and excessively high currents cause rapid wear of the contact tips. The nozzle contact tip must be replaced when it no longer provides accurate wire location or good electrical contact. See Sec. T2.2.6, T2.2.7, T2.5.3 and T2.5.4 for specific instructions for replacing contact tips and other maintenance of the various contact assemblies.

February 1982

Sec. T6.4.2

Wire Reel Mounting for 50 or 60# Coils

Periodically coat the reel shaft with a thin layer of grease. No maintenance of the two-position adjustable brake is needed except to replace the shoe assembly if it wears through.

February 1982

Sec. T6.4.3

Travel Carriage

See maintenance information in Sec. T2.2.4-C.

February 1982

Sec. T6.4.4

Vertical Lift Adjuster

Every month add a few drops of SAE-140 oil or equivalent to the oil cup on the back of the vertical lift housing.

Every year replace the grease in the top section gear cavity with a medium grease.

If the unit is disassembled for cleaning, apply a layer of medium grease to the screw threads of the head lift tube (Item 2 of P-101-S) and head lift screw (8). Apply a thin layer of grease to the OD of the head lift tube and the ID of the long hole in the head lift body (1). Slide the head lift tube into the head lift body and screw in the head lift screw. Fill the upper section gear cavity one-half full of grease. Be sure the needle bearings are packed with grease.

February 1982

Sec. T6.4.5

Horizontal Adjuster

Twice a year apply a thin coat of grease to all sliding surfaces. Every year replace the grease in the gear cavity with a medium grease.

February 1982

Sec. T6.4.6

High Frequency Generator (K238)

See maintenance information in Sec. T2.5.8.

February 1982

Sec. T6.4.7

Spreadarc (K278)

See maintenance information in Sec. T2.5.6.

February 1982

SEC. T6.6 — NA-5 GENERAL TROUBLESHOOTING GUIDE

INTRODUCTION: How To Use This Guide

Sec. T6.6

1. Problems incurred with the NA-5 do not necessarily involve failures in the circuitry. More often, problems are caused by misapplication, misconnection, or shutdown of the NA-5 protective features. Therefore, when a problem is experienced, *first* refer to the GENERAL APPLICATION TROUBLESHOOTING GUIDE below. The instructions in this guide should solve most problems.

2. If the problem being experienced cannot be solved by using the GENERAL APPLICATION TROUBLESHOOTING GUIDE, the problem may be due to a fault in the control circuitry. To detect and correct this fault, refer to the COMPREHENSIVE TROUBLESHOOTING GUIDE, IM-305TS.

TABLE OF CONTENTS

SUBJECT

Sec. T6.6 (Continued)

IA. APPLICATION PROBLEMS

1. Drive rolls turn, but wire will not feed or wire feeding is rough or uneven.

CAUSE	WHAT TO DO
a. Wire jammed or kinked on route through head.	a. Remove wire from head, then feed in new wire. Note any obstruction.
b. Incorrect drive rolls and guide tubes, or incorrect pressure setting.	b. Be sure that the drive rolls and guide tubes are stamped with the wire diameter being used. Replace if necessary. Check for proper pressure setting.
c. Worn drive rolls.	c. Replace, or reverse, if split-type.
d. Partially flashed or melted contact tip.	d. Replace contact tip.

2. Variable or "hunting" arc.

CAUSE	WHAT TO DO
a. Contact tip worn or incorrect size.	a. Replace contact tip.
b. Worn or undersized work cables or poor connections to work.	b. Inspect and repair or replace as necessary.
c. Loose electrode connections.	c. The following connections must be tight: Electrode cable to wire feeder and power source, work cable to power source and work, contact tip to nozzle.
d. Rusty electrode.	d. Replace electrode.

3. Unit will not feed wire. Digital meters are not lit.

CAUSE	WHAT TO DO
a. CONTROL POWER switch OFF.	a. Turn switch ON.
b. Circuit breaker is tripped.	b. Reset breaker.
c. Power Fuse blown.	c. Replace fuse.
d. No 115 V AC supply from power source.	d. Check that the power source is ON. If so, check power source AC fuse.

4. Arc can be struck, but unit then shuts down while welding, or power source output is too low to establish an arc. (ACTUAL VOLTS meter reading is low, or zero, when start is pressed.)

CAUSE	WHAT TO DO
a. Leads 21 and 67 may not be connected for the correct polarity at the terminal strip inside the control box, or not connected to work and electrode.	a. Check the white (work) and black (electrode) leads at the (+) and (−) terminals (per NA-5 wiring diagram).
b. Control leads may be improperly connected at the power source.	b. Check the appropriate power source connection diagram.
c. Welding power source is unable to supply the SET voltage.	c. Reset the output range controls of the power source so that it can supply the desired voltage. See "Out-of-Range Shutdown", Section IB.
d. Power source voltage control switch not set to REMOTE.	d. Voltage control switch of R3S, DC-600 orDC-1500 type power sources must be set to REMOTE.
e. ⅛ A fuse on voltage P.C. board is blown.*	e. Refer to Section II, Problem T6 to determine cause of fuse blowing.

* Voltage P.C. boards built prior to 1983 did not have fuse protection.

Sec. T6.6 (Continued)

5. Poor arc striking with sticking or "blast-offs", weld porosity, narrow and ropy looking bead, or electrode stubbing into plate while welding.

CAUSE	WHAT TO DO
a. Improper procedures or techniques.	a. See "How to Make Submerged Arc Welds" (S604) or "Innershield Production Welding Guide" (N675).
b. Improper wire feed acceleration setting for the process in use.	b. See IM-305 manual.
c. Voltage Control response not set properly for the power source and/or process in use.	c. See IM-305 and the appropriate power source connection diagram.

6. Speedmeter readings and/or wire feed speed are not accurate.

CAUSE	WHAT TO DO
a. The Speedmeter Calibration Jumper is connected to the wrong pin.	a. Select the correct pin to match the drive roll and head ratio being used. See Section IC2.
b. Improper drive rolls.	b. Drive rolls must match wire size.

7. Travel, Burnback, or other modes do not sequence properly.

CAUSE	WHAT TO DO
a. Jumpers on the Logic Board may be connected incorrectly.	a. Consult the manual or wiring diagram for the various alternate pin connections.

Sec. T6.6 (Continued)

IB. OUT-OF-RANGE SHUTDOWN

If the NA-5 voltage control is unable to supply the SET value of arc voltage while welding, the automatic shutdown circuit will activate. This protection circuit immediately returns the NA-5 control to idle state within a few seconds after the arc voltage discrepancy occurs.

Typical causes for the activation of this protective shutdown circuit are as follows (See Sec. IA.4 for remedies.):

a. SET value of arc voltage is outside the power source range.

b. Power source voltage control not set for ''REMOTE''.

c. Misconnection of NA-5 control cable leads to power source.

d. Incorrect weld polarity connections, or settings, at NA-5 or power source.

e. Lost connection of NA-5 voltage-sensing leads (67 and 21) between arc and voltage control, or blown ⅛ A fuse on voltage P.C. boards built since early 1983.

With NA-5 units above Code 8300, the conditions of (d) and (e) above would result in the wrong wire feed direction when the weld is started.

In the case of full-range-control power sources, such as the DC-600, this protective shutdown circuit could prevent welding under the conditions of (c), (d), and (e), above, by holding the power source output at minimum, possibly providing too low of a power source output to even establish an arc. With NA-5 units above Code 8300, condition (c) could cause repeated feed direction reversals which may blow the Field fuse in the NA-5 Power P.C. Board.

Although out of range shutdown can occur with all power sources when working with very low or very high arc voltages, it is most likely to occur when using the R3S models with the somewhat limited voltage range of the various taps. For instance, if the R3S-400 triangle tap setting is for 31 volts, the range of control from the remote circuit is approximately 7 volts; i.e., 27½ to 34½ volts at nominal input voltage. If the NA-5 controls are set for 29 volts and the input voltage to the R3S goes up, it may not be possible for the NA-5 control circuit to hold the 29 volts, so the welding will shut down. By changing to the 27 volt triangle setting, the range will be approximately 23½ to 30½ volts and at high input voltage there will be sufficient control to hold the SET arc voltage. On these machines, if the NA-5 stops welding, follow this procedure:

A. Move the NA-5 voltage set point 2 volts lower than the desired procedure and make a test weld.

   1. If the NA-5 still shuts down, go to Step B. below.

   2. If the NA-5 keeps welding, change the R3S triangle setting to the next *higher* voltage and reset the NA-5 set point to the desired procedure. R3S is now set properly unless there is a significant change in input voltage. Skip the following step.

B. Move the NA-5 voltage set point 2 volts higher than the desired procedure and make a test weld.

   1. If the NA-5 now keeps welding, change the R3S triangle setting to the next *lower* voltage and reset the NA-5 set point to the desired procedure. R3S is now set properly unless there is a significant change in input voltage.

   2. If the NA-5 still shuts down, refer to paragraph below and the other possible causes previously listed.

This same general procedure can be used on other power sources. For example, if the NA-5 keeps shutting down and the other possible causes have been checked, adjust the SET voltage higher and/or lower than the desired voltage. If the NA-5 continues to weld at one of these voltages, it can then be determined what change in the range controls of the power source are required so it can supply the desired voltage.

In some cases, it is also possible to hold the ACTUAL button pressed while starting the arc. Before the NA-5 shuts down, the actual arc voltage can be read on the digital meter. Comparing this reading to SET reading will tell what change in the range controls of the power source are required so it can supply the desired voltage. Should the meter read zero, check NA-5 sensing leads (67 and 21) connections. Should the meter read a negative (−) voltage, the polarity connections or settings at the NA-5 or power source are wrong.

IC. NA-5 ACCURACY CHECKS

1. **Voltmeter Accuracy**

   Perform the following checks with the automatic equipment connected to the welding power source per the proper connection diagram. The power source is to be ON and both the power source and automatic equipment properly set up for welding.

   a. Connect a test voltmeter (with at least 3 digits and ±0.5% accuracy, see box below) between work and the electrode cable connection at the welding head.
   b. While welding the test voltmeter reading should match the ACTUAL VOLTS meter reading within ±0.5 V (typically ±0.2 V). If it does not, refer to COMPREHENSIVE TROUBLESHOOTING GUIDE.
   c. Remove the test voltmeter and, while welding, compare the SET VOLTS and ACTUAL VOLTS meter readings. Depending upon the arc voltage characteristics of the process being welded, the ACTUAL reading may vary somewhat about an average value. The "average" ACTUAL reading should match the SET reading within ±0.5 V (typically ±0.2 V). If it does not, refer to Section II, COMPREHENSIVE TROUBLESHOOTING GUIDE.

   The following is a list of digital meters which would meet or exceed the required 0.5% accuracy. To perform the meter accuracy check, you must have a meter as accurate as these, (0.5%) or better.

Sec. T6.6 (Continued)

1. Fluke #8022A

   John Fluke Mfg. Co.
   P.O. Box 43210
   Mountlake Terrace, WA 98043

2. Triplett #3400

   Triplett Corp.
   286 Harmon Road
   Bluffton, OH 45817

3. Data Precision #935

   Data Precision Corp.
   Electronics Avenue
   Danvers, MA 01923

4. Keithley Model # 169

   Keithley Instruments, Inc.
   28775 Aurora Road
   Cleveland, OH 44139-1891

IC2. Wire Speed Accuracy

a. Check that the Speedmeter Calibration Jumper is connected to the proper calibration pin for the head and drive roll system employed, per the table below.

Speedmeter Calibration	Head Ratio	Drive Roll Part Number	Wire Size Range	Rated Speed Range (in/min)
21[3]	21/1	S12778	Single .035-.052 Solid	100-2070
57F[1]	57/1	S12778 S19113	Single .035-.052 Solid Single .045-.052 Cored	40-778
57[1]	57/1	S12515	Single 1/16-3/32	38-762
95	95/1	S12514	Single 3/32-5/32	22-428
95S[2]	95/1	S12515 S19113 S13161-.052 S13161-5/64 S14904 (outer) S14905 (inner)	Single 1/16-3/32 Single .045-.052 Cored Twin .045-.052 Twin 1/16-5/64 Twin 3/32	23-456
142	142/1	S12514	Single 3/32-7/32	15-289
142T[2]	142/1	S14904 (outer) S14905 (inner)	Twin 5/64-1/8	15-300

[1] Early Speedmeter pins were labeled 55F and 55, respectively.
[2] Early Speedmeter P.C. Boards did not include these calibration pins.
[3] Present on Hi-Speed NA-5 Speedmeter board (L8575-1) only.

b. Check for proper inches of wire fed per revolution of drive roll (IPR):

1. Set the STRIKE Speed Control to any setting between 50 and 125 in/min. Measure the precise length of wire fed by exactly 10 revolutions of the drive roll, while pressing the INCH DOWN button.

2. The measured length should be within the range specified by the table below for the drive roll and wire size employed.

Drive Roll Part Number	Wire Size Range	Inches of Wire Fed per 10 Revolutions of Drive Roll
S12778	Single .035-.052 Solid	53 — 54
S19113	Single .045-.052 Cored	53 — 54
S12515	Single 1/16-3/32	51 — 53
S12514	Single 3/32-5/32	49 — 51
S12515	Single 1/16-3/32	51 — 53
S13161-.052	Twin .045-.052	53 — 55
S13161-5/64	Twin 1/16-5/64	53 — 55
S14904 (outer) S14905 (inner)	Twin 3/32	51 — 52
S12514	Single 3/32-7/32	49 — 52
S14904 (outer) S14905 (inner)	Twin 5/64-1/8	51 — 53

Sec. T6.6 (Continued)

3. If the measured length is not within the specified lengths, refer to Section IA.1 and IA.6.

c. Check for proper drive roll revolutions per minute (RPM):

1. Set the STRIKE Speed Control to obtain the SET Speedmeter reading specified for the Speedmeter Calibration Pin and head ratio employed per the table below.

2. While pressing the INCH DOWN button, the Drive Roll RPM (revolutions counted in 60 seconds) and the ACTUAL Speedmeter reading (ACTUAL button pressed) should be as per table and correspond to the SET Speedmeter reading. If accuracy checks do not match per table, refer to COMPREHENSIVE TROUBLESHOOTING GUIDE.

Speedmeter Calibration Pin	Head Ratio	Set Speedmeter Reading (IPM)	Drive Roll RPM	Actual Speedmeter Reading (IPM)
21[1]	21/1	0.27 (IPM x 1000)	50±2	0.27±0.01 (IPM x 1000)
57F	57/1	268	50±1	268±2
57	57/1	262	50±1	262±2
95	95/1	249	50±1	249±2
95S	95/1	265	50±1	265±2
142	142/1	250	50±1	250±2
142T	142/1	260	50±1	260±2

[1] Present on Hi-Speed NA-5 Speedmeter board only.

ID. PRELIMINARY POWER SUPPLY CHECKS

Due to the unpredictable behavior that may result from faulty power supply outputs, the NA-5 Power Supply Lights should be checked before further troubleshooting is attempted.

Be sure that the power source is ON, and CONTROL POWER switch is ON at the NA-5.

Check each light listed in the table below on the P.C. Boards):

Light	Light Location	Supply Presence Indicated By Light ON
1A	Power Board	+15 V Analog
1B	Power Board	−10 V Analog
1F	Power Board	+115 V Relay
7A	Logic Board	+15 V Logic
Speedmeter Display	Front Panel	+5 V Speedmeter
Voltmeter Display	Front Panel	+5 V Voltmeter

1. If the lights in the table are *all* ON, then the power supplies are probably OK. If any lights are OFF or are very dim, refer to COMPREHENSIVE TROUBLESHOOTING GUIDE.

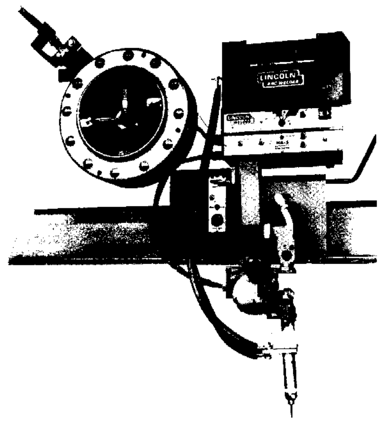
2. If power supplies check OK, locate the problem being experienced in the COMPREHENSIVE TROUBLELESHOOTING GUIDE INDEX and refer to the section specified by the Index.

3. Locate the ADDITIONAL SYMPTOM best describing the problem being experienced and proceed step-by-step through the troubleshooting instructions given for the specific symptom.

RETURN TO MAIN INDEX

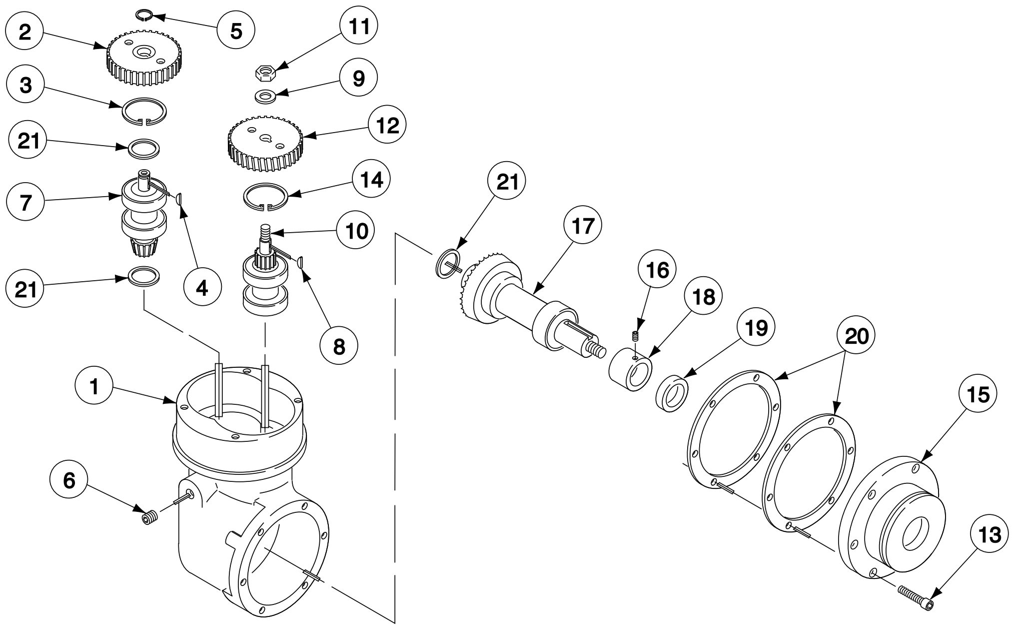
NA-5
SEC. T7.1 – PARTS LIST INDEX

. #



WIRE FEED GEAR BOX

Gear ratio is stenciled on the side of the gear case and on top of Item 12.



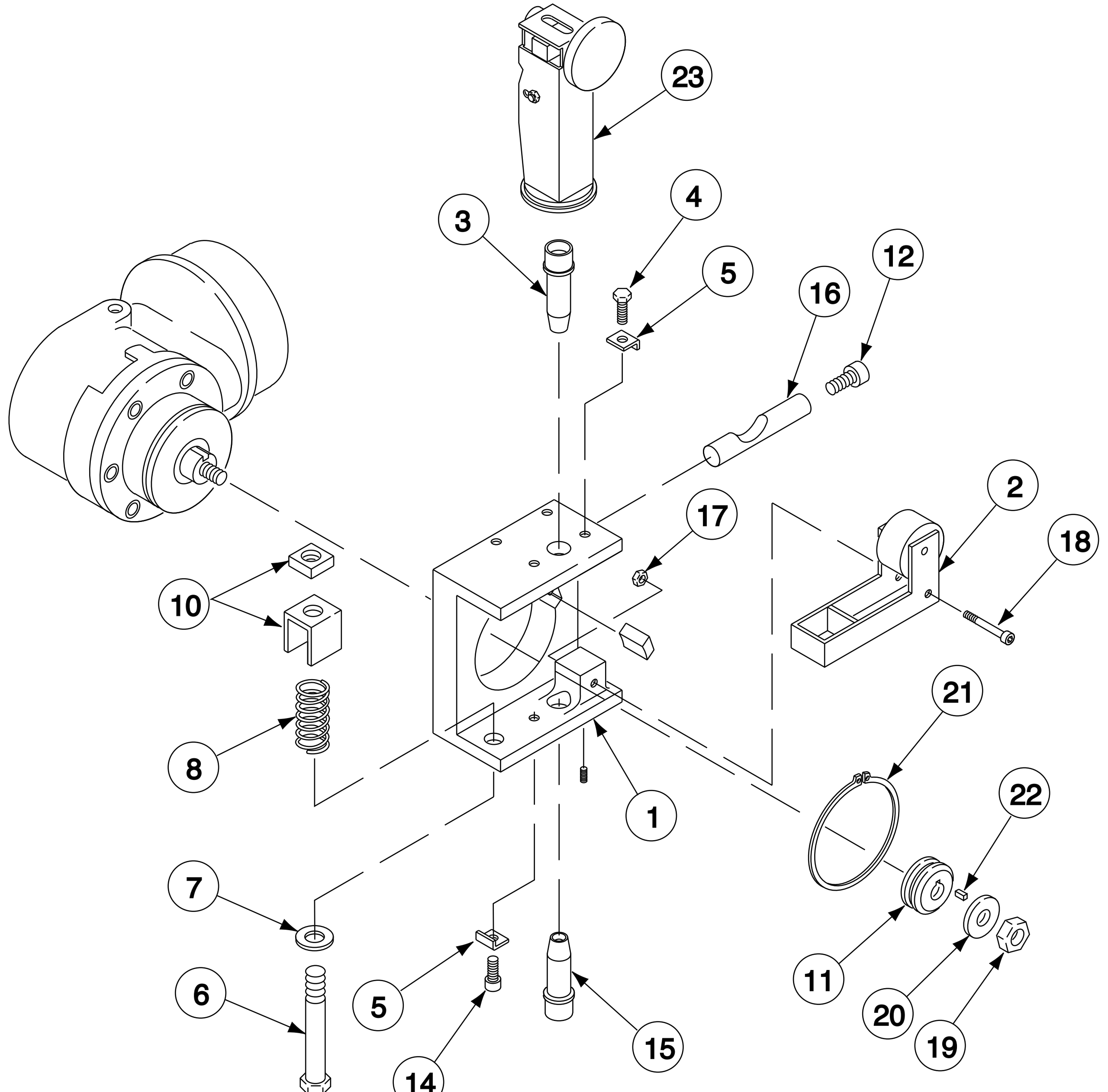
Indicates a Change This Printing

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9
	Gear Box Asbly, (Includes Items 1-21) (95/1 Ratio):	L5199-3	1									
	Gear Box Asbly, (Includes Items 1-21) (55/1 or 57/1 Ratio):	L5199-2	1									
	Gear Box Asbly, (Includes Items 1-21) (142/1 Ratio):	L5199-1	1									
1	Gear Box Case	G1328	1									
2	Gear	S12504	1									
3	Snap Ring	S9776-23	1									
4	Woodruff Key	#304	1									
5	Snap Ring	S9776-16	1									
6	Set Screw - New Design	S11604-26	2									
6	Pipe Plug - Old Design	S10780-5 ø	2									
7	Bevel Shaft Assembly	S12511	1									
8	Woodruff Key	#304	1									
9	Plain Washer	S9262-121	1									
10	Spur Shaft Assembly	S12510	1									
11	5/16-18 HN	CF000029	1									
12	Helical Gear (95/1 Ratio)	S12503	1									
12	Helical Gear (55/1 or 57/1 Ratio)	S12881	1									
12	Helical Gear (142/1 Ratio)	S12882	1									
13	Socket Head Screw	T9447-28	6									
14	Snap Ring	S9776-23	1									
15	Gear Case Collar	M10256	1									
16	Hollow Set Screw	S11604-13	1									
17	Output Shaft Assembly	S12509	1									
18	Drive Roll Spacer	T12146	1									
19	Oil Seal	S7611-15	1									
20	Gasket (.0125 Thick)	T12119-1	As Req'd									
20	Gasket (.004 Thick)	T12119-2	As Req'd									
21	Spacer Washer (.003 Thick)	S9262-110	As Req'd									
21	Spacer Washer (.010 Thick)	S9262-111	As Req'd									

09-27-2007

Ø This part is obsolete and no longer available.

WIRE FEED DRIVE ROLL BOX



* For Twinarc (two electrodes fed through one head) parts, see the appropriate Twinarc Assembly parts list in the P-101 series.

Indicates a Change This Printing

For 3/32 thru 7/32" wire, use the parts marked "X" in column 1.
For 1/16 thru 3/32" wire, use the parts marked "X" in column 2.
For .035 thru .052" wire, use the parts marked "X" in column 3.

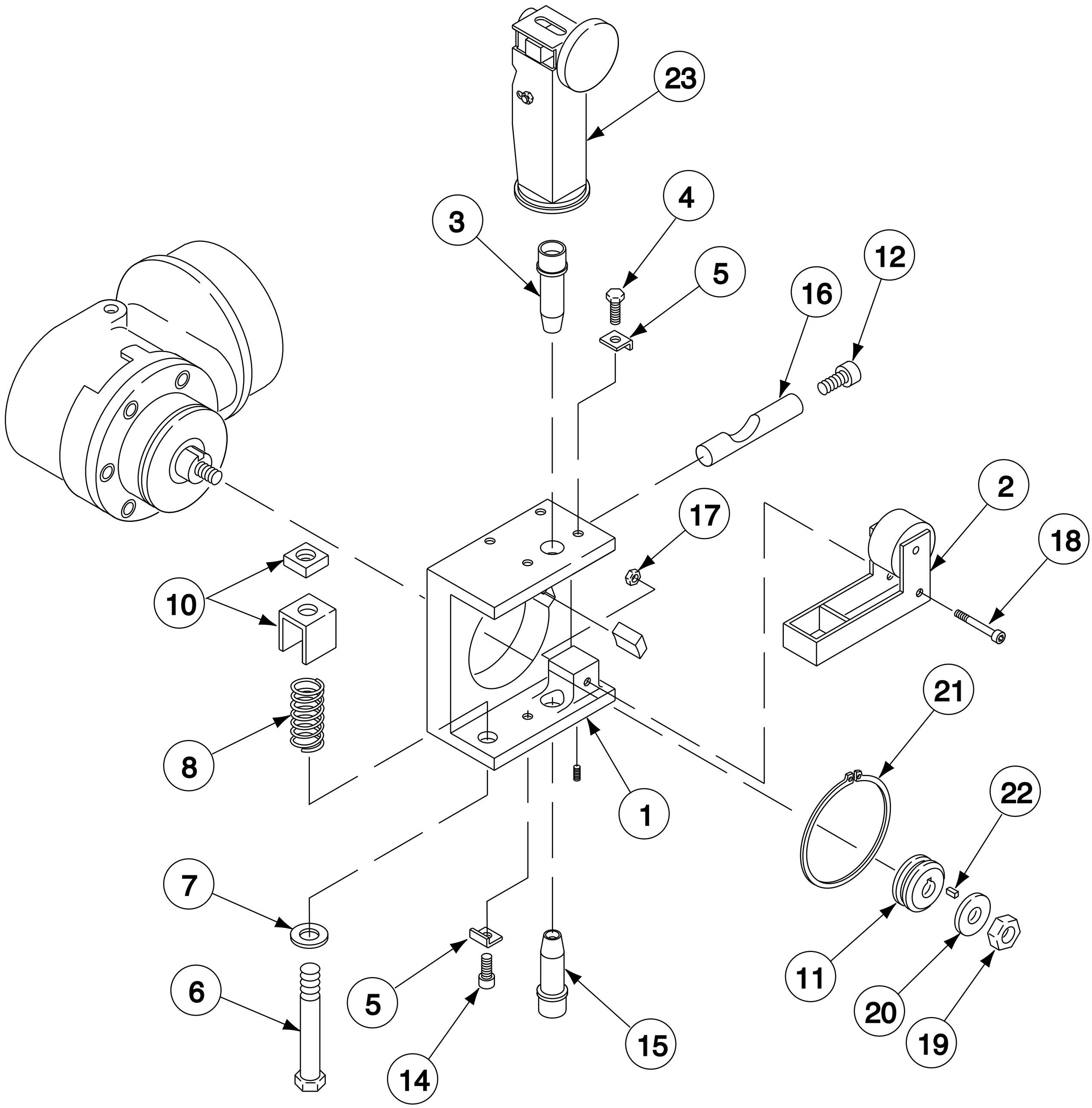
ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9
1	Faceplate	L4052	1	X	X	X						
2*	Idle Roll Assembly	S12475	1	X	X	X						
3*	Incoming Guide Tube (3/32 thru 7/32"), Includes:	S10168-4	1	X	•	•						
3*	Incoming Guide Tube (1/16 thru 3/32"), Includes:	S10168-2	1	•	X	•						
3*	Incoming Guide Tube (.035 thru .052"), Includes:	S12857	1	•	•	X						
	.035-.045 Spring Guide	T9367-4	1	X	X	X						
4	5/16-18 x .75 HHCS	CF000040	2	X	X	X						
5	Guide Tube Mounting Clip	T8400	4	X	X	X						
6	Idle Roll Spring Screw, NA-2 Models Only	T10317-6	1	X	X	X						
6	3/8-16 x 3 HHCS (NA-3, NA-4, & NA-5 Models)	CF000039	1	X	X	X						
7	Flat Washer	S9262-120	1	X	X	X						
8	Idle Roll Spring	T10247-7	1	X	X	X						
10	5/16-18 SQN (NA-2 Models)	CF000212	1	X	X	X						
10	Yoke Indicator Asbly (NA-3, NA-4 & NA-5 Models)	T13610	1	X	X	X						
11*	Drive Roll (3/32 thru 7/32")	S12514	2	X	•	•						
11*	Drive Roll (1/16 thru 3/32")	S12515	2	•	X	•						
11*	Drive Roll (.035 thru .052")	S12778	1	•	•	X						
12	Socket Head Cap Screw	T9447-32	1	X	X	X						
14	Socket Head Cap Screw	T9447-12	2	X	X	X						
15*	Outgoing Guide Tube (3/32 thru 7/32")	S10170-1	1	X	•	•						
15*	Outgoing Guide Tube (1/16 thru 3/32")	T13635-3/32	1	•	X	•						
15*	Outgoing Guide Tube (.035 thru .052")	T13635-.052	1	•	•	X						
16	Draw Bolt	T12090-1 ø	1	X	X	X						
17	1/4-20 HN	CF000017	1	X	X	X						
18	Stripper Bolt	T10317-7 ø	1	X	X	X						
19	Drive Roll Nut	T10552	1	X	X	X						
20	Drive Roll Washer	S9262-44	1	X	X	X						
21	Snap Ring	S11910-2	1	X	X	X						
22	Drive Roll Key	M8776-5	1	X	X	X						
23*	Wire Straightener, Single Wire	See P-100-K or P-100-M	1	X	X	•						

Note: When using K231 or K233 Contact Nozzle, a long guide sleeve is required inside the Nozzle. See P-101-M or P-101-D.

Ø This part is obsolete and no longer available.

WIRE FEED DRIVE ROLL BOX

(For Codes Above 8800)



L6991

* For Twinarc (two electrodes fed through one head) parts, see the appropriate Twinarc Assembly parts list in the P-101 series.

\# Indicates a Change This Printing

For 3/32 thru 7/32" wire, use the parts marked "X" in column 1.
For 1/16 thru 3/32" wire, use the parts marked "X" in column 2.
For .035 thru .052" wire, use the parts marked "X" in column 3.
For .045 thru .052" Cored Wire, use the parts marked "X" in column 4.

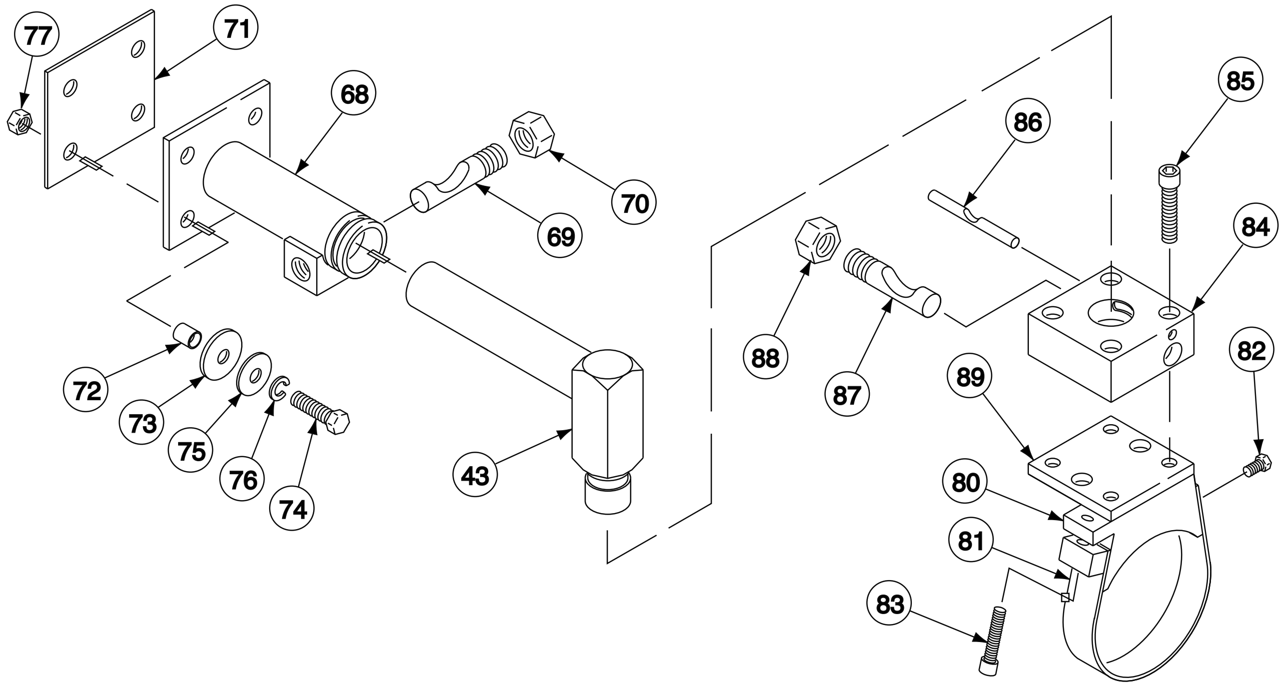
ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9
1	Gear Box Assembly	See P-100-C	1	X	X	X	X					
2	Face Plate	L6987	1	X	X	X	X					
3*	Idle Roll Assembly	S12475	1	X	X	X	X					
4*	Incoming Guide Tube (3/32 thru 7/32")	KP2116-2	1	X	•	•	•					
4*	Incoming Guide Tube (1/16 thru 3/32")	KP2116-1	1	•	X	•	•					
4*	Incoming Guide Tube [.035 thru .052" (.045 thru .052" Cored)]	KP1967-1	1	•	•	X	X					
5	5/16-18 x .75 HHCS	CF000040	2	X	X	X	X					
6	Mounting Clip	T8400	4	X	X	X	X					
7	3/16-16 x 3.00 HHCS	CF000039	1	X	X	X	X					
8	Plain Washer	S9262-120	1	X	X	X	X					
9	Pivot Pin	T12206-1	1	X	X	X	X					
10	Idle Roll Spring	T10247-7	1	X	X	X	X					
11	Yoke Indicator Assembly	T13610	1	X	X	X	X					
12	Drive Roll Nut	T10552	1	X	X	X	X					
13	Drive Roll Washer	S9262-44	1	X	X	X	X					
14*	Drive Roll (3/32" thru 7/32")	S12514	2	X	•	•	•					
14*	Drive Roll (1/16" thru 3/32")	S12515	2	•	X	•	•					
14*	Drive Roll (.035" thru .052")	S12778	1	•	•	X	•					
14*	Drive Roll (.045" thru .052" Cored Wire)(NA5,NA4,NA3)	S19113	2	•	•	•	X					
16	Snap Ring	S11910-2	1	X	X	X	X					
17	Drive Roll Key	M8776-5	1	X	X	X	X					
18	Wire Straightener, Single Wire	See P-100-K or -M	1	X	X	•	•					
19*	Outgoing Tube (3/32" thru 7/32")	S10170-1	1	X	•	•	•					
19*	Outgoing Tube (1/16 thru 3/32")	T13635-3/32	1	•	X	•	•					
19*	Outgoing Tube [.035 thru .052" (.045 thru .052" Cored)]	T13635-.052	1	•	•	X	X					
20	Socket Head Cap Screw	T9447-12	2	X	X	X	X					
21	Socket Head Cap Screw	T9447-32	1	X	X	X	X					
24	24 Thru 27	See P-100-F		X	X	X	X					
28	Cross Seam Adjuster Assembly	See P-100-L	1	X	X	X	X					
29	29 thru 34	See P-100-F		X	X	X	X					
35	Plain Washer	S9262-131	1	X	X	X	X					
36	Locking Key	T14896	1	X	X	X	X					
37	Hollow Head Set Screw	S11604-8	1	X	X	X	X					

Optional Drive Roller Conversion Kits:
(Includes Drive Roll, Incoming & Outgoing Guide Tubes)

3/32" thru 7/32" Wire	T13724-A
1/16" thru 3/32" Wire	T13724-B
.035" thru .052" Solid Wire	T13724-C
.045" thru .052" Cored Wire	T13724-D
.035" thru .045 Spring Guide	T9367-4

Note: When using K231 or K233 Contact Nozzle, a long guide sleeve is required inside the nozzle. See P-202-M or P-101-D.

HEAD MOUNTING



For standard NA-2, NA-3N, NA-3S, NA-4, NA-5N and NA-5S, use parts marked "X" in column 1. For NA-2, NA-3N, NA-3S, NA-4, NA-5N and NA-5S with high frequency, use parts marked "X" in column 2. For NA-3F, NA-2FV, NA-3NF, NA-3SF, NA-5NF and NA-5SF, use parts marked "X" in column 3.

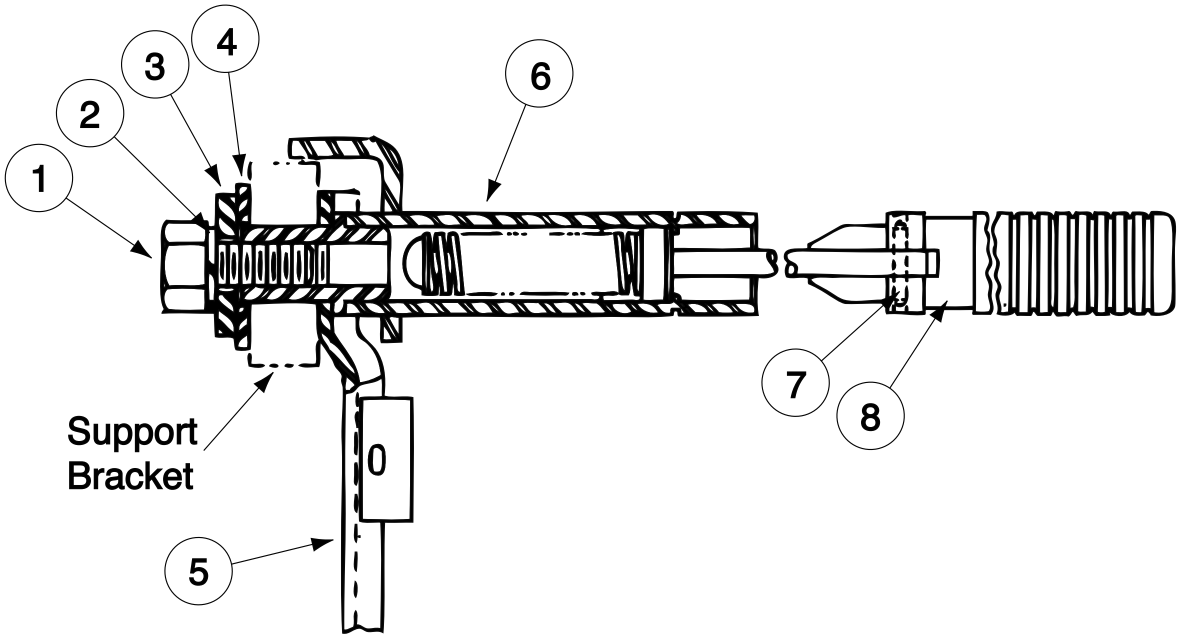
Indicates a Change This Printing

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9
43	Head Support	M8232	1	X	X	•						
	Mounting Bracket (Not Used on Tractor Models) Includes Items 68 thru 77	M6769	1	X	•	•						
68	Welding Head Support Bracket, Includes:	M4016	1	X	X	•						
69	Draw Bolt (Head Support to Mtg Bracket)	T4893	1	X	X	•						
70	3/4-10 HN (Head Support to Mtg Bracket)	CF000025	1	X	X	•						
71	Insulation	S4322	1	X	•	•						
72	Insulation Bushing	T7305-18	4	X	•	•						
73	Insulation Washer	S10773-9	4	X	•	•						
74	1/2-13 x 1.75 HHCS	CF000277	4	X	•	•						
75	Washer	S9262-1	4	X	•	•						
76	Lock Washer	E106A-5	4	X	•	•						
77	1/2-13 HN	CF000027	4	X	X	•						
	Insulation Asbly, High Frequency	S11771-1	1	•	X	•						
	1/2-13 x 1.25 HHCS	CF000030	4	•	X	•						
	Lock Washer	E106A-5	8	•	X	•						
80	Clamping Bracket	M10213	1	X	X	X						
81	Clamping Band	S12472	1	X	X	X						
82	3/8-16 x .75 HHCS (Clamp to Gear Case)	CF000034	1	X	X	X						
83	Socket Head Cap Screw (Clamp to Gear Case)	T9447-18	1	X	X	X						
84	Pivot Block	M10215	1	X	X	•						
85	3/8-16 x 1.50 SHCS (Block to Clamping Brkt) (Except NA-5N & S)	T9447-18	4	X	X	•						
85	3/8-16 x 2.75 (Block to Clamping Brkt) (NA-5N & S Only)	T9447-31	4	X	X	•						
86	Roll Pin (Pivot Block to Head Support)	T9967-29	1	X	X	•						
87	Draw Bolt (Pivot Block to Head Support)	T4893-3	1	X	X	•						
88	3/4-10 HN (Pivot Block to Head Support)	CF000025	1	X	X	•						
89	Spacer (NA-5N & NA-5S Only)	S10262-6	4	X	X	•						

P-100-G (NA-3, NA-4 and NA-5)

WIRE REEL AND REEL MOUNTING

(NA-3N, NA-3S, NA-4, NA-5N and NA-5S)



Indicates a Change This Printing

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9
	Wire Reel Shaft Asbly, Includes:	M12908	1									
1	1/2-13 x 1.00 HHCS	CF000276	1									
2	Lock Washer	E106A-5	1									
3	Plain Washer	S9262-14	1									
4	Plain Washer	S9262-119	1									
5	Brake Assembly, Includes:	S14882	1									
	Brake Shoe	T13519	1									
6	Wire Reel Shaft	S15492	1									
7	Roll Pin	T9967-9	1									
8	Pull Knob	S11038	1									
	Following Parts Not Illustrated											
	Wire Reel	L4604	1									
	U-Shaped Shaft Mounting Bracket	M12907	1									
	Following Parts Mount M12907 - No High Frequency											
	Flat Insulation	T8477-20	1									
	Insulation Tube	T12478-6	2									
	Insulation Washer	S10773-9	2									
	1/2-13 x 1.75 HHCS	CF000277	2									
	1/2-13 HN	CF000027	2									
	Following Parts Mount M12907 w/High Freq Insulation											
	Insulation Asbly	S11771-2	1									
	1/2-13 x 1.00 HHCS (Insulation to M12907)	CF000276	4									
	1/2-13 HN	CF000027	4									

CABLE ASSEMBLIES – POWER SOURCE TO CONTROLS & CONTROLS TO HEAD

Indicates a Change This Printing

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9
	NA-2, NA-2F & NA-2FV											
	Cable Assembly (Power Source to Controls), Includes:	K97*	1									
	Multi-Conductor Control Cable	L4112-1*	1									
	Electrode Cable	L4112-2*	1									
	Cable Assembly (Controls to Head), Includes:		1									
	Electrode Cable (63 inches long)	L2286-191	2									
	NA-3 (ALL MODELS), NA-4 (w/CURRENT CONTROL RHEOSTAT) AND NA-5 (ALL MODELS EXCEPT -R)											
	Cable Assembly (Power Source to Controls), Includes:	K215*	1									
	Multi-Conductor Control Cable, Includes:	L5267-B*	1									
	Polarized Socket Connector	S12020-8	1									
	Connector Clamp	S12024-2	1									
	Electrode Cable	L5267-C *	1									
	Cable Asbly (Controls to Head) (NA-3N, -NF, & -SF), Includes:	K234*	1									
	Multi-Conductor Control Cable (Motor), Includes:	L5318-D*	1									
	Polarized Pin Connector	S12020-15	1									
	Polarized Receptacle Connector	S12023-9	1									
	Cable Clamp	S12024-4	2									
	Electrode Cable	L5118-E*	2									
	Cable Asbly (Controls to Head) (NA-3S & NA-4), Includes:	K235*	1									
	Multi-Conductor Control Cable (Flux Valve), Includes:	L5318-B* ø	1									
	Polarized Pin Connector	S12020-16	1									
	Polarized Receptacle Connector	S12023-8	1									
	Cable Clamp	S12024-4	2									
	Multi-Conductor Control Cable (Motor) Includes:	L5318-D*	1									
	Polarized Pin Connector	S12020-15	1									
	Polarized Receptacle Connector	S12023-9	1									
	Cable Clamp	S12024-4	2									
	Electrode Cable	L5318-E*	2									
	Cable Asbly (Controls to Head) (NA-5N, NF, & SF), Includes:	K338*	1									
	Multi-Conductor Control Cable (Motor), Includes:	L6211-D*	1									
	Polarized Pin Connector	S12020-27	1									
	Polarized Receptacle Connector	S12023-12	1									
	Cable Clamp	S12024-1	2									
	Multi-Conductor Shielded Cable (Tach) Includes:	L6211-F*	1									
	Polarized Pin Connector	S12020-17	1									
	Polarized Receptacle Connector	S12023-10	1									
	Cable Clamp	S12024-4	2									
	Electrode Cable	L6211-G*	2									
	Cable Asbly (Controls to Head) (NA-5S) Includes:	K335	1									
	Multi-Conductor Control Cable (Flux), Includes:	L6211-B*	1									
	Polarized Pin Connector	S12020-16	1									
	Polarized Receptacle Connector	S12023-8	1									
	Cable Clamp	S12024-4	2									
	Multi-Conductor Control Cable (Motor), Includes:	L6211-D*	1									
	Polarized Pin Connector	S12020-27	1									
	Polarized Receptacle Connector	S12023-12	1									

Ø This part is obsolete and no longer available.

CABLE ASSEMBLIES – POWER SOURCE TO CONTROLS & CONTROLS TO HEAD

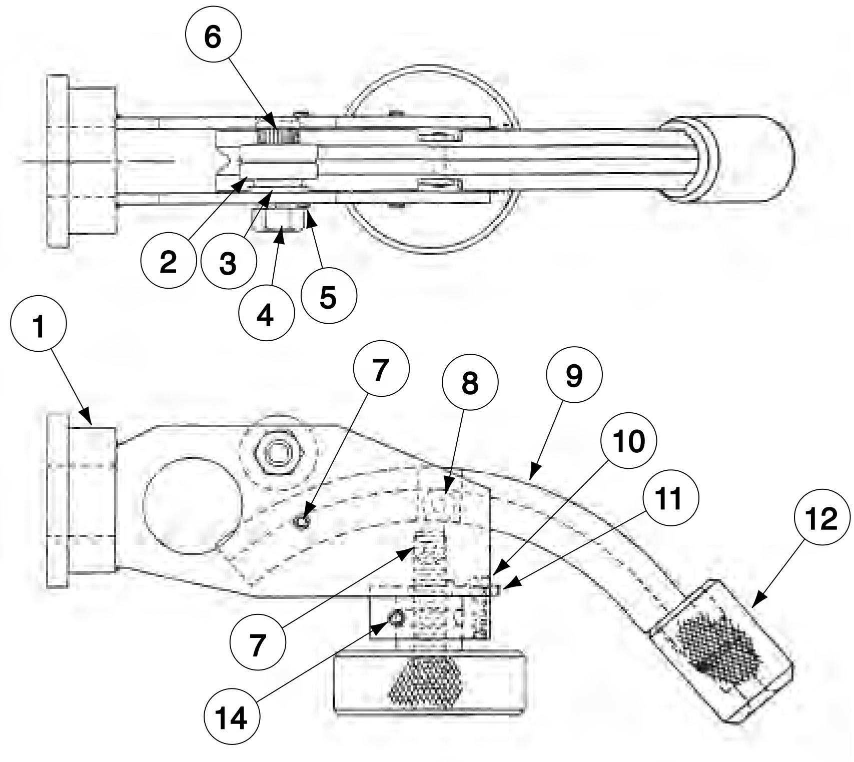
Indicates a Change This Printing

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9
	Cable Clamp	S12024-1	2									
	Multi-Conductor Shielded Cable (Tach) Includes:	L6211-F*	1									
	Polarized Pin Connector	S12020-17	1									
	Polarized Receptacle Connector	S12023-10	1									
	Cable Clamp	S12024-4	2									
	Electrode Cable	L6211-G*	2									
	NA-4 (WITH CURRENT CONTROL SWITCH)											
	Cable Assembly (Power Source to Controls), Includes:	K216*	1									
	Multi-Conductor Control Cable, Includes:	L5231-B*	1									
	Polarized Socket Connector	S12020-9	1									
	Connector Clamp	S12024-2	1									
	Electrode Cable	L5231-C*	1									
	Cable Assembly (Controls to Head), Includes:	K235*	1									
	For K235 Parts Break-Down see P-100-H.a											
	NA-5R											
	Cable Assembly (Power Source to Controls) Includes:	K374*	1									
	Multi-Conductor Control Cable, Includes:	L5267-B*	1									
	Polarized Socket Connector	S12020-8	1									
	Connector Clamp	S12024-2	1									
	Electrode Cable	L5267-C*	1									
	Cable Assembly (Controls to Head), Includes:	K338	1									
	For K338 Parts Break-Down see P-100-H.a											

* Specify Length

FLUX-CORED WIRE STRAIGHTENER – SINGLE ARC

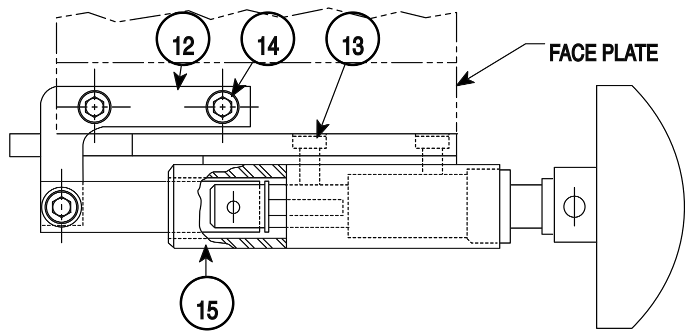
1/16” thru 5/32” Electrodes

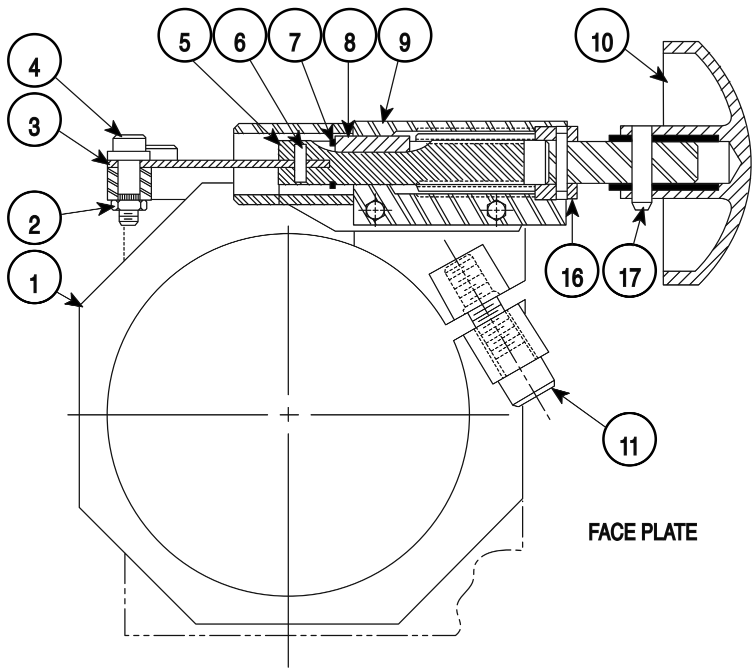


Indicates a Change This Printing

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9
	Wire Straightener, Includes:	M10214	1									
1	Body Assembly	M10311	1									
2	Bearing	M9300-55	2									
3	Washer	S9262-140	1									
4	Lock Washer	E106A-3	1									
5	5/16-18 HN	CF000029	1									
6	Socket Head Screw	T9447-13	1									
7	Rollpin	T9967-30	2									
8	Connecting Link	T12141	1									
9	Wire Guide	S12551	1									
10	#8-32 x .50 RHS	CF000033	1									
11	Retainer Plate	T12145	1									
12	Wire Guide	T12126	1									
13	Adjusting Knob	S12547	1									
14	Adjusting Screw	T12102	1									

CROSS SEAM ADJUSTER





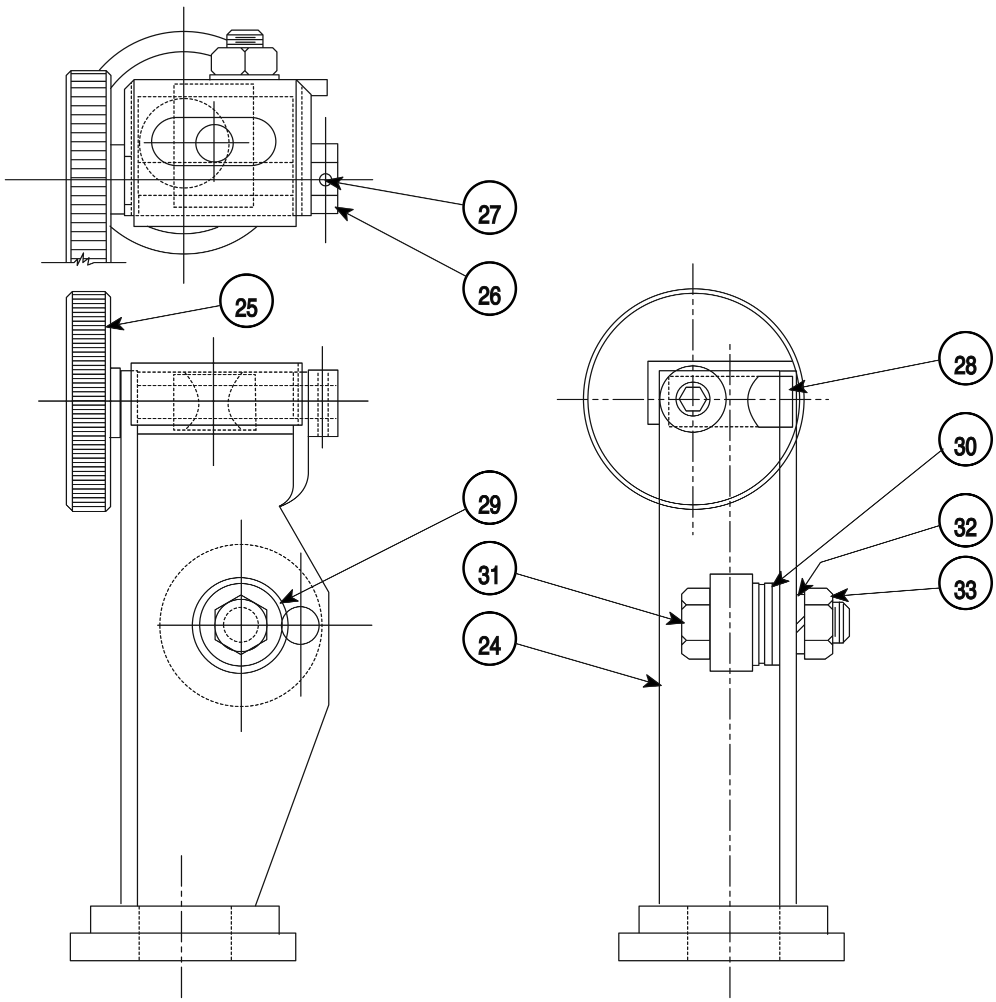
Indicates a Change This Printing

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9
	Cross Seam Adjuster Assembly, Includes:	M10802	1									
1	Clamping Ring	M10787	1									
2	#10-24 HN	CF000010	1									
3	Flat Spring	T8701-1	1									
4	Shoulder Screw	T12535	1									
5	Adjusting Screw	S13202	1									
6	Roll Pin	T9967-8	1									
7	Retaining Ring	S9776-3	1									
8	Key	M8776-6	1									
9	Adjusting Block	S13203	1									
10	Handle	T8312	1									
11	Socket Head Screw	T9447-18	1									
12	Mounting Arm	S13204	1									
13	Socket Head Screw	T9447-9	2									
14	Socket Head Screw	T9447-10	2									
15	Spatter Guard	S13233	1									
16	Sleeve	T12537	1									
17	Drive Pin	T8433	1									

09-27-2007

SOLID WIRE STRAIGHTENER – SINGLE & TWINARC

5/64 thru 7/32" Electrodes

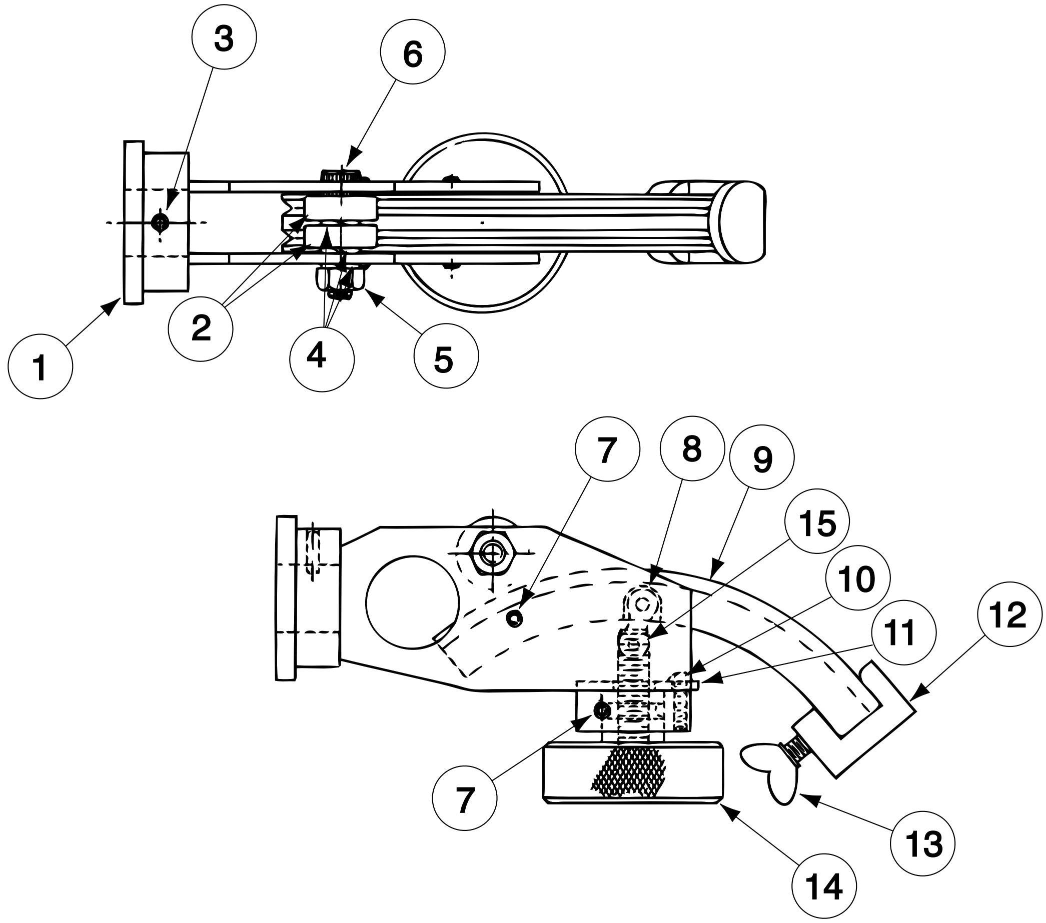


Indicates a Change This Printing

Use only the parts marked "X" in the column under the heading number called for in the model index page.

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9
	Wire Straightener, Single Arc, Includes:	M8269-1	1	X	•							
	Wire Straightener, Twinarc, Includes:	M8269-2	1	•	X							
24	Body	M8268	1	X	X							
25	Cross Slide Screw	S10159	1	X	X							
26	Bushing - Locates Slide Screw in Body	T10585	1	X	X							
27	Roll Pin - Bushing to Slide Screw	T9967-5	1	X	X							
28	Slide Bushing	T10584	1	X	•							
28	Slide Bushing	T10587	1	•	X							
29	Wire Guide Wheel Bearing	M9300-55	2	X	•							
29	Wire Guide Wheel	T10592-1	1	•	X							
30	Plainwasher - Bearing to Body	S9262-140	2	X	X							
31	5/16-18 x 1.25 HHCS - Bearing to Body	CF000028	1	X	X							
32	Lock Washer - Bearing to Body	E106A-3	1	X	X							
33	5/16-18 HN - Bearing to Body	CF000029	1	X	X							

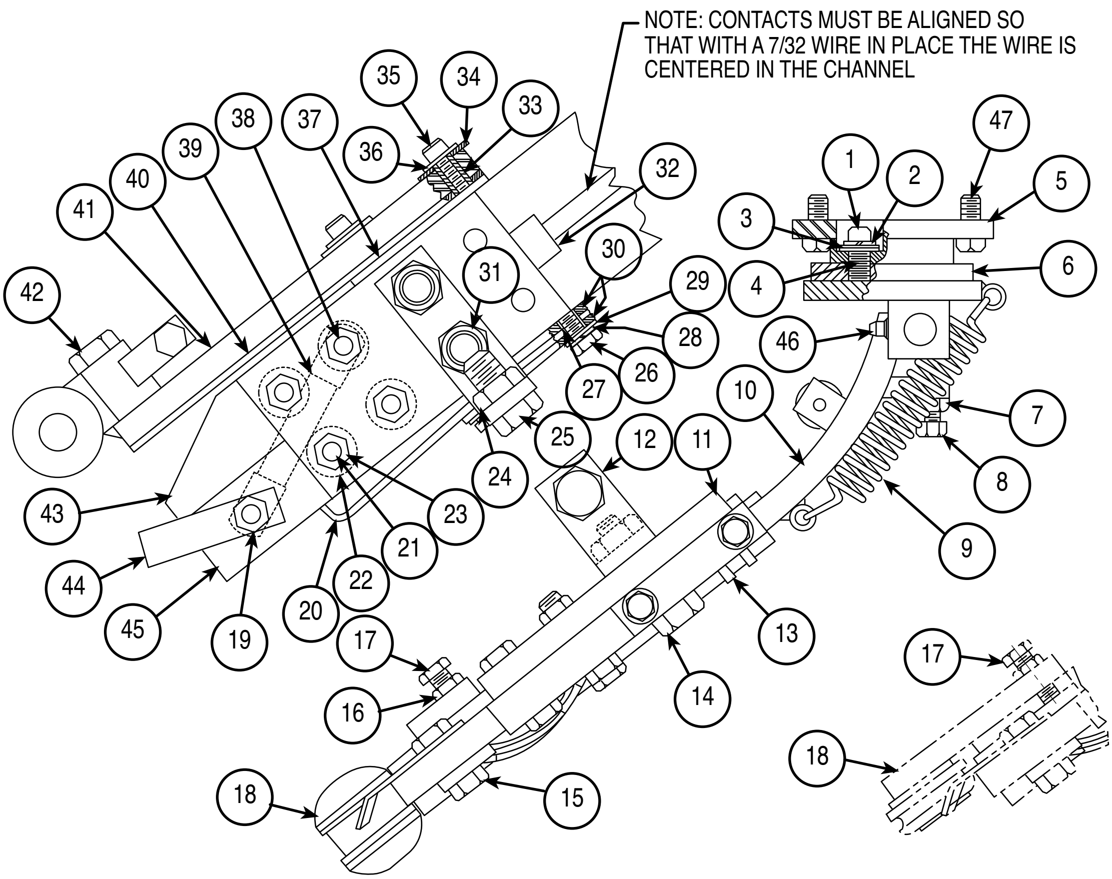
FLUX CORED WIRE STRAIGHTENER – TWINARC



Indicates a Change This Printing

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9
	Wire Straightener, Includes:	M12470	1									
1	Body Assembly	M10311-1	1									
2	Bearing	M9300-55	2									
3	Roll Pin	T9967-3	1									
4	Lock Washer	E106A-3	3									
5	5/16-18 HN	CF000029	1									
6	Socket Head Screw	T9447-20	1									
7	Roll Pin	T9967-30	2									
8	Connecting Link	T12141	1									
9	Wire Guide	M12469	1									
10	#8-32 x .50 RHS	CF000033	1									
11	Retainer Plate	T12145	1									
12	Ingoing Wire Guide	S14888	1									
13	Wing Screw	T9078	1									
14	Adjusting Knob	S12547	1									
15	Adjusting Screw	T12102	1									

K218 HORIZONTAL FILLET/LAP ATTACHMENT



L5313
6-12-81U

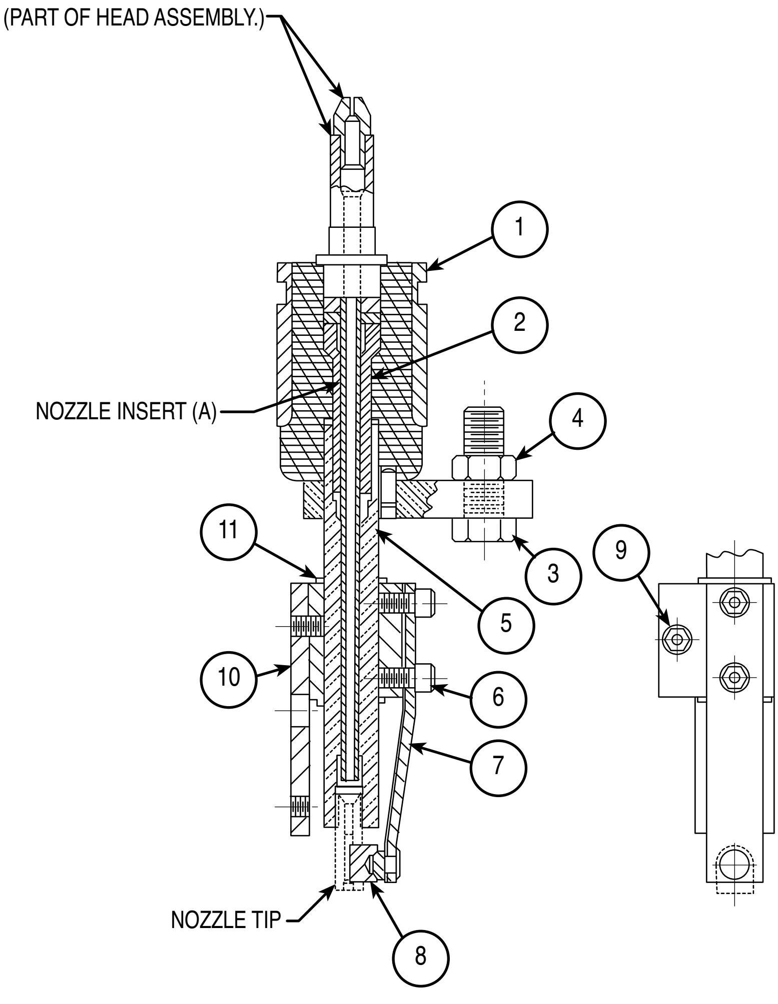
Indicates a Change This Printing

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9	
1	Socket Head Screw	T9447-10	4										
2	Flat Washer	S9262-23	4										
3	Insulating Washer	S10773-12	8										
4	Insulating Bushing	T8390	4										
5	Nose Adapter	M12478	1										
6	Adapter Insulation	T8391	1										
7	Hex Jam Nut	5/16-18	1										
8	Hex Head Cap Screw	5/16-18 x 1.00	1										
9	Spring	T8528	1										
10	Pivot Assembly	M8592	1										
11	Lead Block	S7273	1										
12	Connection	T8573 ø	1										
13	Hex Head Screw	3/8-16 x 1.00	2										
14	Hex Head Cap Screw	1/2-13 x 1.75	2										
15	Hex Head Cap Screw	3/8-16 x 1.00	1										
16	Hex Jam Nut	5/16-18	1										
17	Hex Head Screw - Fillet Attachment	5/16-18 x 1.00	1										
17	Hex Head Screw - Lap Attachment	T9694-8	1										
18	Roller Bracket Assembly - Fillet Attachment	S16749 ø	1										#
18	Roller Bracket Assembly - Lap Attachment	S7398 ø	1										#
19	Hex Jam Nut	3/8-16	1										
20	Wire Guide Spring	S7664	1										
21	Hex Head Cap Screw	3/8-16 x 1.25	2										
22	Flat Washer	S9262-4	4										
23	Hex Jam Nut	3/8-16	4										
24	Hex Jam Nut	1/2-13	1										
25	Hex Head Cap Screw	1/2-13 x 1.00	1										
26	Thread Cutting Screw	S9225-17	2										
27	Insulation Bushing	T8725	2										
28	Lockwasher	E106A-2	2										
29	Flat Washer	S9262-23	2										
30	Spring Insulation	T8724	2										
31	Hex Jam Nut	1/2-13	2										
32	Cover Plate	T8404	1										
33	Insulating Bushing	T7028-23	2										
34	Insulating Washer	S10773-41	2										
35	Socket Head Screw	T9447-11	2										
36	Flat Washer	S9262-30	2										
37	Spacer	T8752	1										
38	Hex Head Cap Screw	3/8-16 x 1.50	2										
39	Lead	S7266	1										
40	Insulation	S7387	1										
41	Roll Support	S7386 ø	1										#
42	Hex Head Cap Screw	1/2-13 x 1.25	1										
43	Wire Contact Block	S16640-2	1										
44	Leaf Spring	T8435	1										
45	Wire Contact Block	S16640-1	1										
46	Grease Fitting	T11683-1 ø	2										#
47	Hex Head Screw	5/16-18 x .75	2										
	Items Not Illustrated:												
	Flux Tube	S10490	1										
	Flux Control	M8765	1										
	Head Pivot	M12595	1										

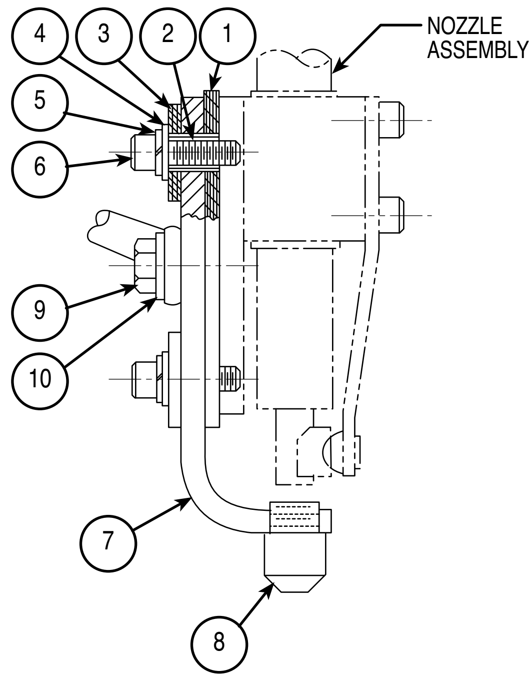
Ø This part is obsolete and no longer available.

K233 (and K103) CONTACT NOZZLE
K104 LINC-FILL EXTENSION

NOTE A: The K103 nozzle for the NA2 is identical to the K233 except for Item A (nozzle insert). For the NA2 use both the appropriate Item A and the appropriate outgoing guide tube (Item 15 of P-100-D).



NOTE A: The K103 nozzle for the NA2 is identical to the K233 except for item A (nozzle insert). For the NA2 use both the appropriate Item A and the appropriate outgoing guide tube (Item 15 of P-100-D).



K104

M12736
1-11-74B

S12776
5-27-66C

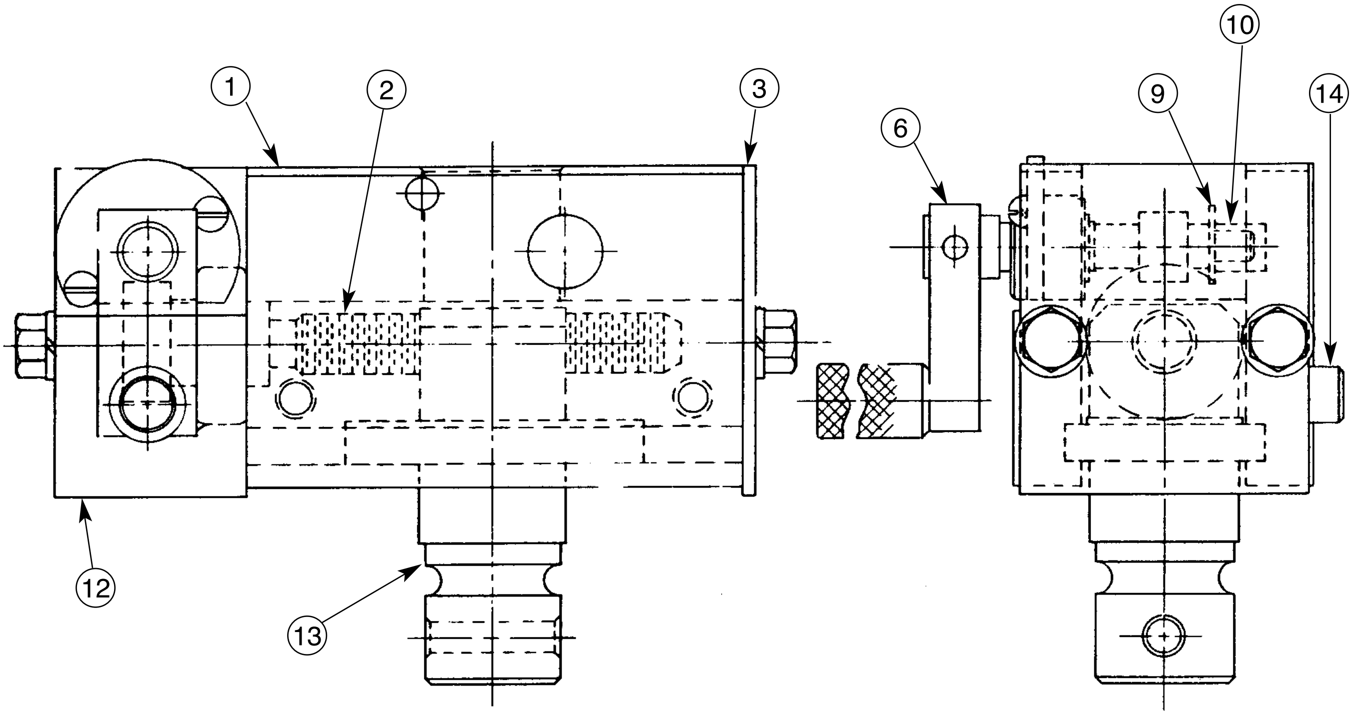
\# Indicates a Change This Printing

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9	
	Nozzle Assembly, Includes:	K233	1										
A	Nozzle Insert, .035 - .052 Electrode	S15106-.052 Note A	1										
A	Nozzle Insert, 1/16, 5/64 and 3/32 Electrode	S15106-3/32 Note A	1										
1	Nozzle Insulator	S10493-1	1										
2	Socket Head Screw	T10570	1										
3	Hex Head Screw	1/2-13x1-1/2	1										
4	Hex Nut	1/2-13	1										
5	Nozzle Body	S10157-1	1										
6	Socket Head Cap Screw	T9447-8	2										
7	Pressure Spring Assembly	S10798 ø	1										
8	Contact Pressure Shoe	T12336	1										
9	Socket Head Cap Screw	T9447-11	1										
10	Spring Bracket Assembly	M10547 ø	1										#
11	Retaining Spring	S9776-12	2										
12	Nozzle Tip	S12775-3/32	1										
12	Nozzle Tip	S12775-5/64	1										
12	Nozzle Tip	S12775-1/16	1										
12 F	Nozzle Tip	S12775-.052	1										
12	Nozzle Tip	S12775-.045 ø	1										
12	Nozzle Tip	S12775-.035 ø	1										
	Extension Assembly, Includes All Below	K104	1										
1	Insulating Plate	S11027-6 ø	1										
2	Insulating Bushing	T12335	2										
3	Insulating Washer	S10773-41	2										
4	Flat Washer	S9262-23	2										
5	Lockwasher	E106A-2	2										
6	Socket Head Cap Screw	T9447-10	2										
7	Extension Guide Arm	M10554	1										
8	Wire Guide - 3/32 Electrode	S12774-3/32	1										
8	Wire Guide - 5/64 Electrode	S12774-5/64	1										
8	Wire Guide - 1/16 Electrode	S12774-1/16	1										
8	Wire Guide - .045 Electrode	S12774-.045	1										
8	Wire Guide - .035 Electrode	S12774-.035	1										
9	Hex Head Cap Screw	1/4-20x1/2	1										
10	Flat Washer	S9262-23	1										

05-13-2002

Ø This part is obsolete and no longer available.

K96 HORIZONTAL ADJUSTER



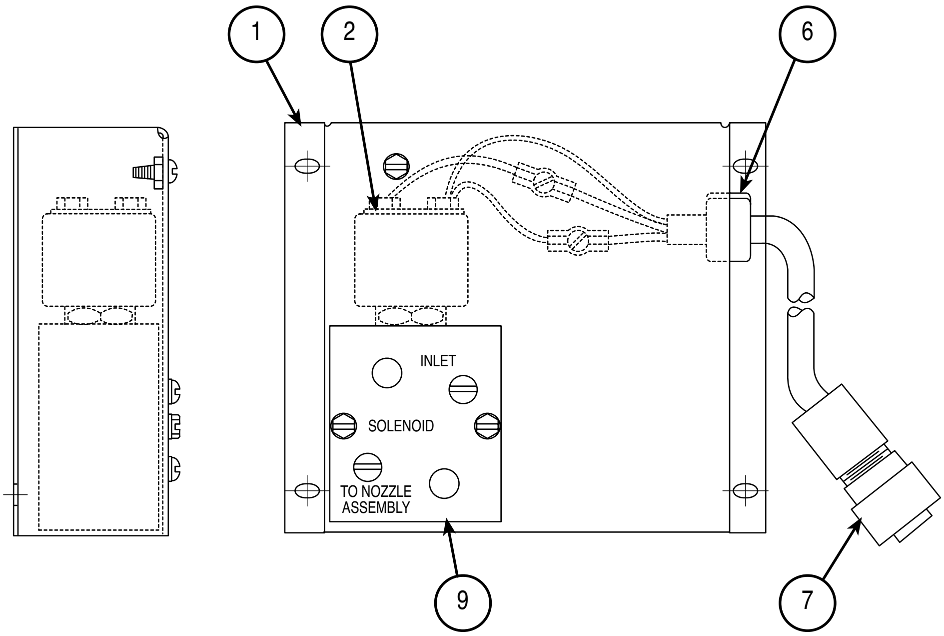
M10224
6-16-78B

Indicates a Change This Printing

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9
	Horizontal Adjuster, Includes all Below	K96	1									
1	Cross Adjustment Block	M13663	1									
2	Cross Adjustment Screw Assembly	S12734	1									
3	End Cover Plate	S10509-38	1									
6	Head Lift Adjustment Shaft Assembly	S10097	1									
9	Thrust Washer	S9262-37	1									
10	Needle Bearing	S10116-1	1									
12	Crank Housing	M10223	1									
13	Cross Slide Assembly	S12491	1									
14	Socket Head Cap Screw	T9447-31	2									
	Roll Pin	T9967-29	1									
	Draw Bolt	T4893-4	1									
	Hex Nut	3/4-10	1									

K223 SOLENOID ASSEMBLY

(NA3, NA4 and NA5)



M12665
7-22-83T

Indicates a Change This Printing

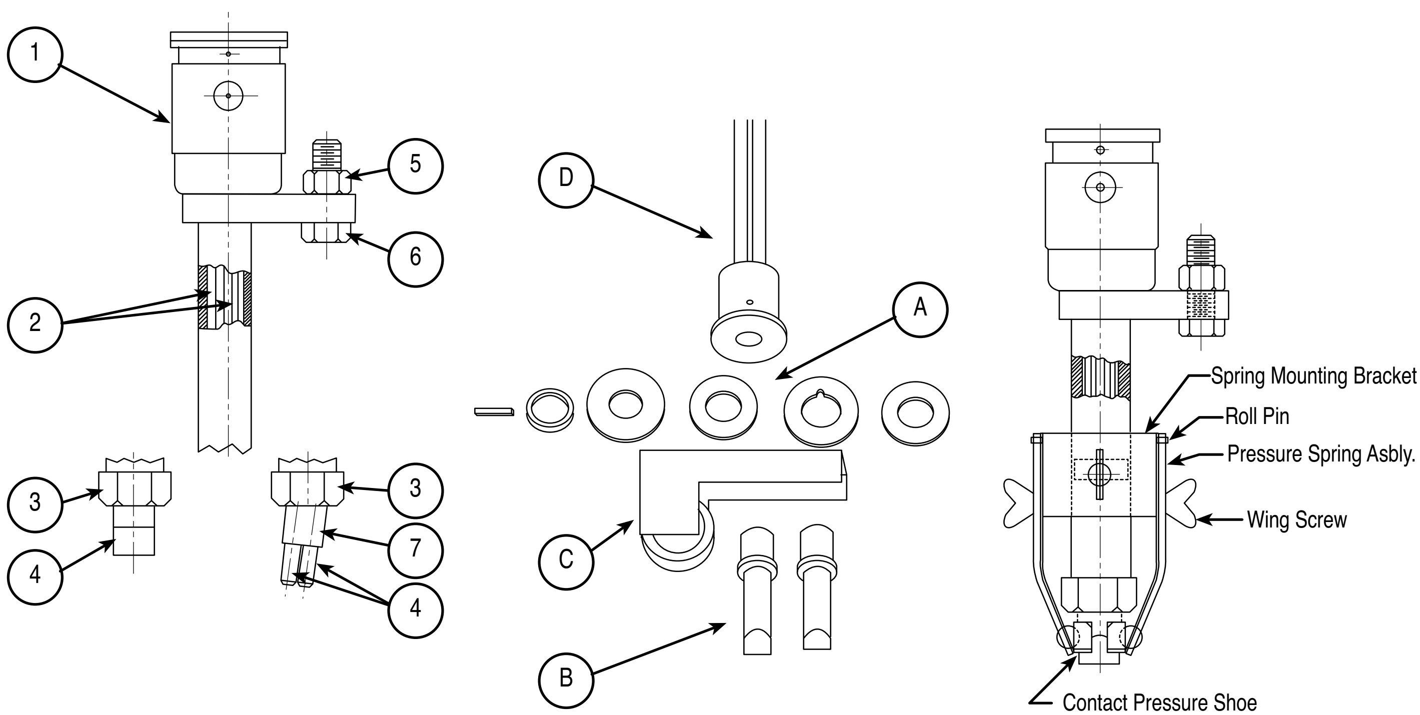
ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9	
	Solenoid Assembly, Includes:	K223	1										
1	Solenoid Mounting Bracket	L5276	1										
2	Solenoid and Valve Assembly	M11675-A	1										#
6	Strain Relief Grommet	T9274-3	1										
7	Cable Assembly	M12664	1										
9	Name Plate	S13246	1										

K129 SUBMERGED ARC TINY TWINARC®

NOTES:

Nozzles with spring loaded contact shoes (illustrated below, right) should be converted to the newer design by discarding items named below and using the appropriate contact tip holder and tips or correct one piece contact tip, depending on wire size.

Intermediate design (one piece) contact tips for 1/16 and 5/64 wire should be converted to the new (lower replacement cost) contact tip holder and contact tips design by ordering the appropriate contact tips and tip holder from the parts list below.



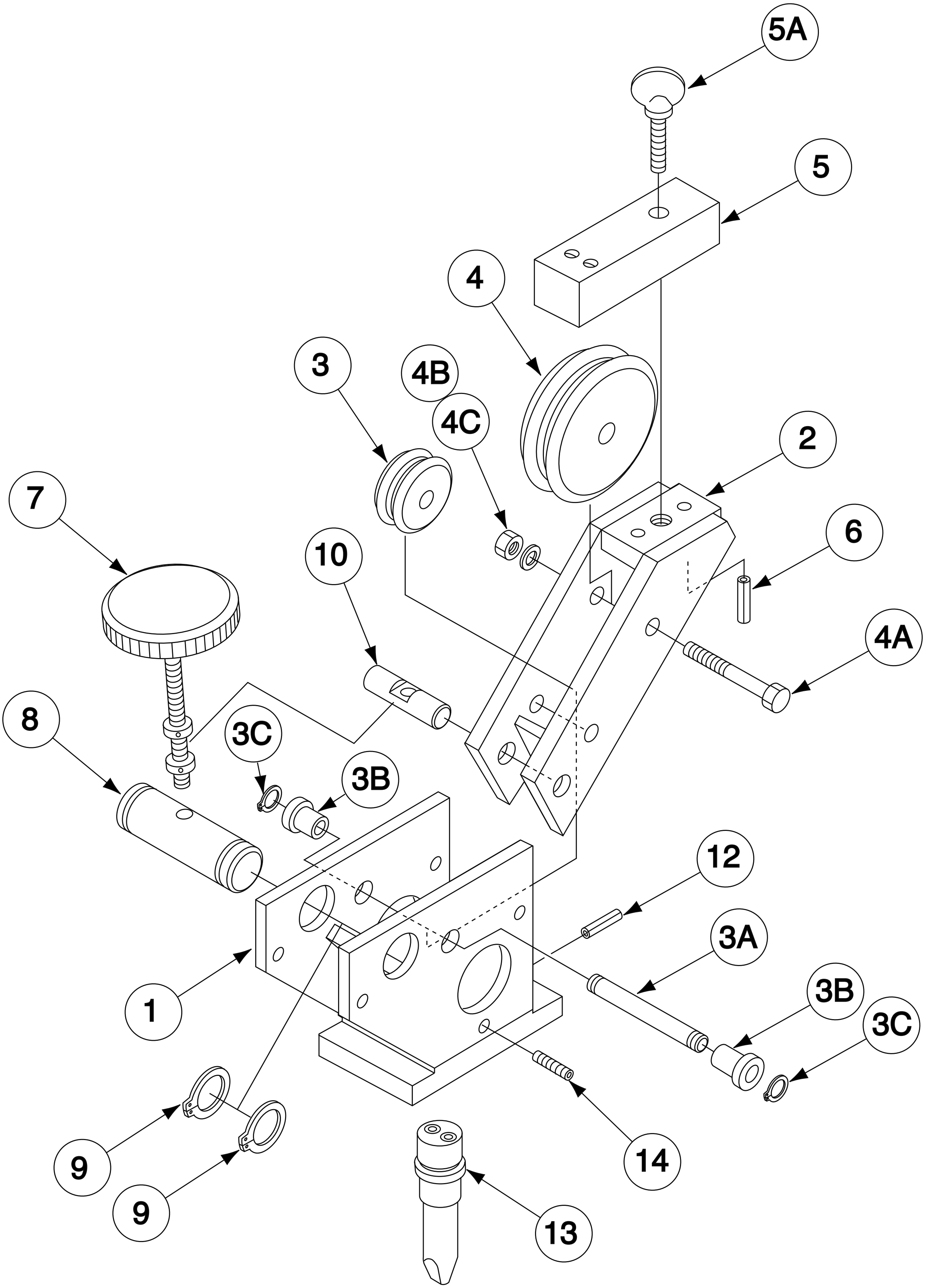
M11609
4-16-76J

• Specify Wire Size
Indicates a Change This Printing

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9
	Twinarc - Complete - Includes All Below	K129*	1									
	Nozzle Assembly - Stripped - Includes Items 1, 3, 5 & 6	M11609	1									
	.045 Wire Kit - Includes Items 2, 4, A & B	KP1901-1	1									
	1/16 Wire Kit - Includes Items 2, 4, 7, A & B	KP1901-2	1									
	5/64 Wire Kit - Includes Items 2, 4, 7, A & B	KP1901-4	1									
	3/32 Wire Kit - Includes Items 2, 4, 7, A & B	KP1901-3	1									
1	Nozzle Body Assembly	S13164	1									
2	Guide Tube - .045 & .052 Wire	KP2092-1	2									
2	Guide Tube - 1/16, 5/64 & 3/32 Wire	KP2092-2	2									
3	Nozzle Collar	S13157	1									
4	Contact Tip - .045 Wire	KP1979-1	1									
4	Contact Tip - .052 Wire	KP1979-2	1									
4	Contact Tip - 1/16 Wire	KP2100-2	2									
4	Contact Tip - 5/64 Wire (See Note AA)	KP2100-4	2									
4	Contact Tip - 3/32 Wire	KP2100-3	1									
5	1/2-13 HN	CF000027	1									
6	1/2-13 x 1.50 HHCS	CF000052	1									
7	Tip Holder - 1/16, 5/64 & 3/32 Wire (Std.), Includes	KP1988-1	1									
	Nozzle Insert	KP2094-4	2									
7	Tip Holder - (Special Side-by-Side Wire)	KP2171-1	As Req'd									
Note AA	When Tip Life is limited by tip being fused over, the use of T14726-5/64 Tips may result in a lower overall cost.											
A	Drive Roll - .045 & .052 Wire	KP1888-1	1									
A	Drive Roll - 1/16 & 5/64 Wire	KP1888-2	1									
A	Drive Roll Assembly - 3/32 Wire, Includes:											
	Outer Drive Rolls	KP1889-1	2									
	Center Drive Rolls	S14905	1									
	Drive Roll Spacer	T12146-1	1									
	Drive Roll Key	M8776-6	1									
B	Wire Guides - .045 & .052 Wire	KP1970-1	2									
B	Wire Guides - 1/16 Wire	KP1970-2	2									
B	Wire Guides - 5/64 & 3/32 Wire	KP1970-3	2									
C	Idle Roll Assembly, Includes:	S13165	1									
	Idle Roll	S18583	1									
D	Incoming Wire Guide Assembly	KP2122-1	1									
	Second Wire Reel & Mountings	See P-100-G	1									

P-101-G.2.a

K281 WIRE STRAIGHTENER FOR TINY TWINARC®



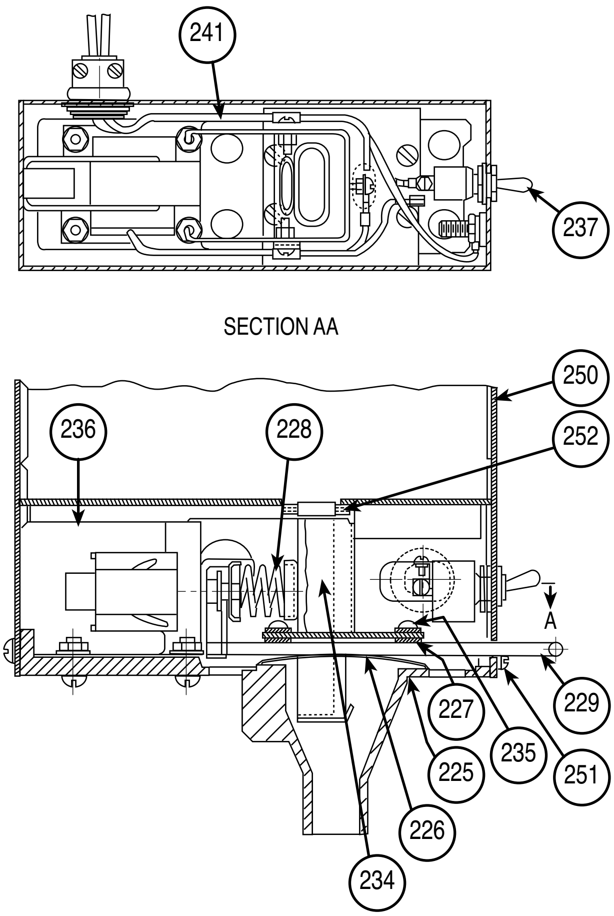
• Specify Wire Size
Indicates a Change This Printing

USE COLUMN ONE FOR TINY TWINARC
USE COLUMN TWO FOR TWIN MIG TORCH

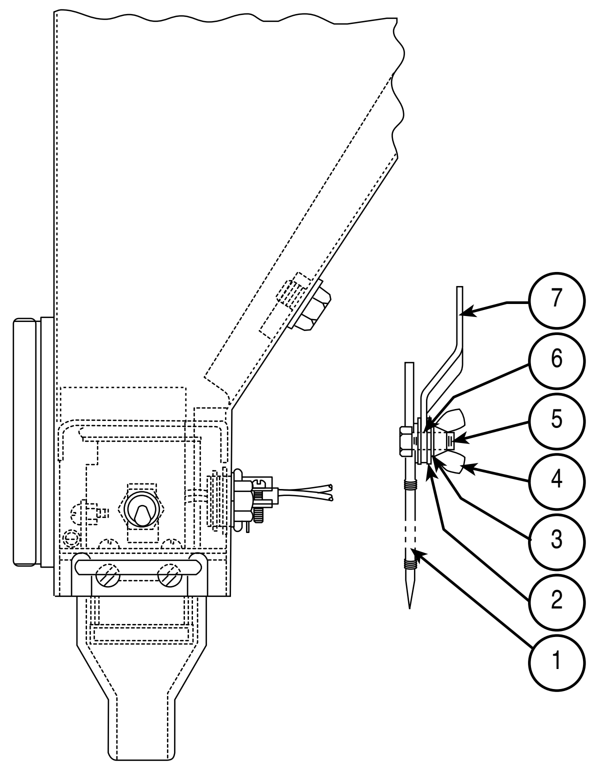
ITEM	DESCRIPTION		PART NO.	QTY.	# 1	# 2	3	4	5	6	7	8	9
1	Base		S15943	1	X	X							
2	Tension Arm		S15946	1	X	X							
3	Roller Assembly, Includes:	(2 1/4" Shaft)	S15953-1	1	X	•							
	Roller Shaft		T14099	1	X	•							
	Retaining Ring		S9776-1	2	X	•							
3	Roller Assembly, Includes:	(2 1/2" Shaft)	S15953-3	1	X	X							
3A	Roller Shaft		S18729	1	X	X							
3B	Bushing		S18728	2	X	X							
3C	Retaining Ring		S9776-4	2	X	X							
4	Roller Assembly Includes:		S15953-2	1	X	X							
	Roller		S15950	1	X	X							
	Bearing Shaft		S18727-1	1	X	X							
	Retaining Ring		S11964-7	2	X	X							
	Bearing		M9300-83	2	X	X							
4A	Hex Head Cap Screw		5/16-18 x 2.00	1	X	X							
4B	Lock Washer		E106-A3	1	X	X							
4C	Hex Nut		5/16-18	1	X	X							
5	Incoming Guide Assembly, Includes:		T14090	1	X	X							
5A	Thumb Screw		T14088	1	X	X							
5B	Nozzle Insert (Not Shown)		T12576-3	4	X	X							
6	Roll Pin		T9967-38	2	X	X							
7	Adjusting Screw Assembly		T14092	1	X	X							
8	Large Pivot		T14086	1	X	X							
9	Retaining Ring		S9776-12	2	X	X							
10	Small Pivot Shaft		T14087	1	X	X							
12	Roll Pin		T9967-8	1	X	X							
13	Wire Guide Assembly		T14093	1	X	•							
14	Set Screw		S11604-21	1	X	X							

P-101-H

FLUX HOPPER



L3552
8-21-81P



T12590
1-16-76H

Indicates a Change This Printing

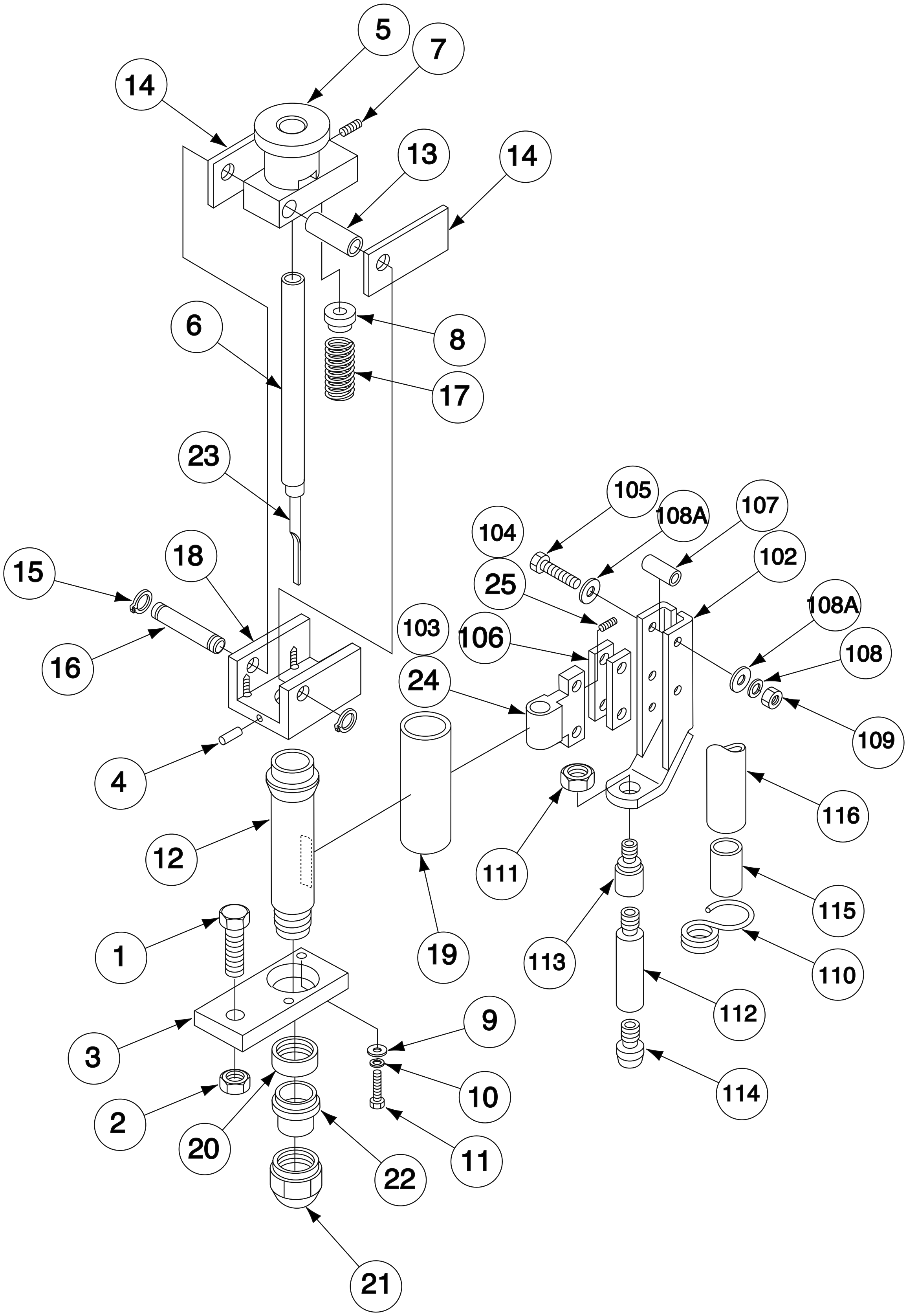
For the NA2, use the parts marked "X" in Column 1.
For the NA3, NA4 and NA5, use the parts marked "X" in Column 2.
For the NA454, use the parts marked "X" in Column 3.

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9	
	Flux Hopper Assembly, Includes:	L3552-E	1	X	•	•							
	Flux Hopper Assembly, Includes: (Standard)	L3552-F	1	•	X	•							
	Flux Hopper Assembly, Includes:	L3552-G	1	•	•	X							
225	Flux Hopper Base	L3100	1	X	X	X							
226	Flux Gate Spring	T10573	2	X	X	X							
227	Flux Gate Wear Plate	T10600	2	X	X	X							
228	Flux Gate Spring	T10603	1	X	X	X							
229	Flux Gate Assembly, Includes:	S10131-3	1	X	X	X							
	Flux Gate: Sub Assembly	S10131-2	1	X	X	X							#
	Solenoid Plunger	T10598-2	1	X	X	X							
	Spring Retaining Washer	T10599	1	X	X	X							
	Retaining Ring	S9776-4	1	X	X	X							
	Washer	S9262-98	1	X	X	X							
234	Flux Tube Assembly	S10130	1	X	X	X							
235	Sems Screw	T10082-4	4	X	X	X							
236	Solenoid	S11085	1	X	X	X							
237	Switch	T10616	1	X	X	X							
241	Cable	S13252	1	X	•	X							
241	Cable	M12555	1	•	X	X							
250	Flux Hopper Assembly	M10818 ø	1	•	•	X							
250	Flux Hopper Assembly (Standard)	M10818-1	1	•	X	•							
250	Flux Hopper Assembly	M13563	1	•	•	X							
251	Sems Screw	T10082-4	1	X	X	X							
252	Gasket	T10545	1	X	X	X							
256	Flux Tube (Not Shown)	T10642-11	1	X	•	•							
257	Flux Tube (Not Shown)	S7748-35	1	X	•	•							
	Pointer and Mounting Bracket Assembly, Includes:	T12590	1	X	•	•							
	Pointer and Mounting Bracket Assembly, Includes:	T12590-1	1	•	X	•							
1	Pointer	S10103	1	X	•	•							
1	Pointer	S10103-2	1	•	X	•							
2	Insulating Washer	S10773-9	2	X	X	•							
3	Washer	S9262-1	2	X	X	•							
4	Wing Nut	T9968-3	1	X	X	•							
5	Hex Head Bolt	T8775-2	1	X	X	•							
6	Insulating Bushing	T8776	1	X	X	•							
7	Pointer Bracket	M8226	1	X	X	•							
	Door Hinge Assembly	S16233	2	•	X	•							
	Hex Head Bolt, Hopper Mounting	1/4-20 x 6	2	•	X	•							

Ø This part is obsolete and no longer available

P-101-K

K148 CONTACT NOZZLE ASSEMBLY
K149 LINC-FILL EXTENSION ASSEMBLY

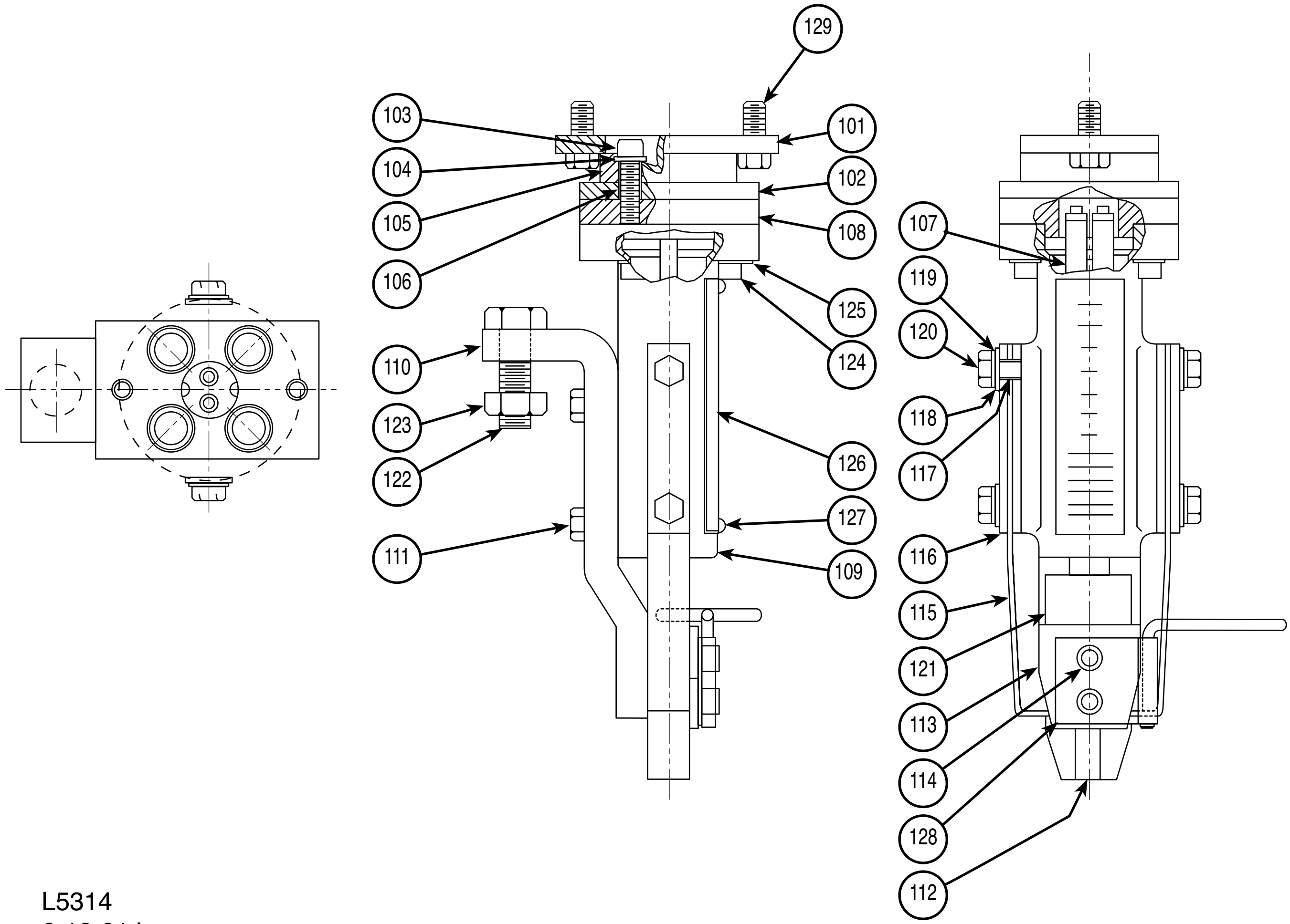


Indicates a Change This Printing

Use Columns 1, 2 & 3 for Standard K148 Nozzles. Use Columns 4 & 5 for Modified Series Arc Equipment Nozzles. Use appropriate column for K149 Extensions based on wire size for standard extensions or Part No. for Modified Series Arc Equipment.

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9	
	Nozzle Asbly (Wire Size 3/32 - .120-1/8), Includes:	K148A	1	X	•	•	•	•					
	Nozzle Asbly (Wire Size 5/32 - 3/16), Includes:	K148B	1	•	X	•	•	•					
	Nozzle Asbly (Wire Size .068 - 5/64), Includes:	K148C	1	•	•	X	•	•					
	Nozzle Asbly (Wire Size 5/32 - 3/16), Includes:	L4621-4 & -6	1	•	•	•	X	•					
	Nozzle Asbly (Wire Size 3/32 - .120-1/8), Includes:	L4621-5	1	•	•	•	•	X					
1	1/2-13 x 1.5 HHCS	CF000052	1	X	X	X	X	X					
2	1/2-23 HN	CF000027	1	X	X	X	X	X					
3	Cable Connector	S12576	1	X	X	X	X	X					
4	Roll Pin	T9967-35	1	X	X	X	X	X					
5	Pivot Body	M10340-1	1	X	X	X	X	X					
6	Guide Tube Asbly, 3/32, .120, 1/8 Wire	KP1974-1	1	X	•	•	•	X					
6	Guide Tube Asbly, 5/32, 3/16 Wire	KP1974-2	1	•	X	•	X	•					
6	Guide Tube Asbly, .068, 5/64 Wire	KP1974-3	1	•	•	X	•	•					
7	Set Screw	S11604-19	1	X	X	X	X	X					
8	Insulating Spacer	T12157	1	X	X	X	X	X					
9	Flat Washer	S9262-23	2	X	X	X	X	X					
10	Lock Washer	E106A-2	2	X	X	X	X	X					#
11	1/4-20 x 1.00 HHCS	CF000015	2	X	X	X	X	X					
12	Nozzle Body	M11327	1	X	X	X	X	X					
13	Insulating Tube	T7028-51	1	X	X	X	X	X					
14	Insulation	S12579	2	X	X	X	X	X					
15	Snap Ring	S9776-25	2	X	X	X	X	X					
16	Pivot Pin	T12158	1	X	X	X	X	X					
17	Spring	T10247-8	1	X	X	X	X	X					
18	Nozzle Holder	S13762	1	X	X	X	X	X					
19	Window Cover	S7748-64	1	X	X	X	•	•					
20	Thread Protecting Collar	S13805	1	X	X	X	X	X					
21	Nozzle Collar	S13804	1	X	X	X	X	X					
22	Nozzle Tip	KP1973-1	1	X	X	•	X	X					
22	Nozzle Tip	KP1991-1	1	•	•	X	•	•					
23	Inner Guide	KP1980-1	1	•	•	X	•	•					
24	Extension Support Arm Mounting Bracket	S13758	1	•	•	•	X	X					
25	Set Screw	S11604-19	1	•	•	•	X	X					
	Water Cooling Tube Assembly (Not Illustrated)	T12928	1	X	X	X	•	•					
	K149 Linc-Fill Extension Asbly, Includes:	K149-3/32 Wire	1	X	•	•	•	•	•				
	K149 Linc-Fill Extension Asbly, Includes:	K149-.120 Wire	1	•	X	•	•	•	•				
	K149 Linc-Fill Extension Asbly, Includes:	K149-1/8 Wire	1	•	•	X	•	•	•				
	K149 Linc-Fill Extension Asbly, Includes:	K149-5/32 Wire	1	•	•	•	X	•	•				
	K149 Linc-Fill Extension Asbly, Includes:	K149-3/16 Wire	1	•	•	•	•	X	•				
	Linc-Fill Extension Asbly & L4621-6 Nozzle, Includes:	M13868	1	•	•	•	•	•	X				
102	Extension Arm Asbly	S13757	1	X	X	X	X	X	X				
103	Mounting Block	S13758	1	X	X	X	X	X	•				
104	Set Screw	S11604-19	1	X	X	X	X	X	•				
105	1/4-20 x 1 3/8 HHCS	CF000118	2	X	X	X	X	X	X				
106	Insulation	T8477-16	2	X	X	X	X	X	X				
107	Insulating Tube	T11851-3	2	X	X	X	X	X	X				
108	Lock Washer	E106A-2	2	X	X	X	X	X	X				
108A	Plain Washer	S9262-23	2	X	X	X	X	X	X				
109	1/4-20 HN	CF000017	2	X	X	X	X	X	X				
110	Flux Hose Clamp	T12929	1	X	X	X	X	X	•				
111	5/8-11 HJN	CF000140	1	X	X	X	X	X	X				
112	Extension Tube - 2" Long	KP1975-2	1	•	•	X	X	X	•				
113	Extension Tube - 1" Long	KP1975-1	1	•	X	•	•	•	X				
114	Extension Tube End (2 3/4 Electrical Stickout)	KP1976-3	1	X	•	•	•	•	•				
114	Extension Tube End (2 1/4 Electrical Stickout)	KP1990-1	1	X	•	•	•	•	•				
114	Extension Tube End	KP1976-1	1	•	X	X	•	•	•				
114	Extension Tube End	KP1976-4	1	•	•	•	X	•	•				
114	Extension Tube End	KP1976-2	1	•	•	•	•	X	X				
115	Flux Hose	T10642-34	1	X	X	X	X	X	•				
116	Flux Hose	S7748-35	1	X	X	X	X	X	•				
	Nozzle Assembly (L4261-6)	See Above List	1	•	•	•	•	•	X				

K225 SUBMERGED ARC TWINARC KIT

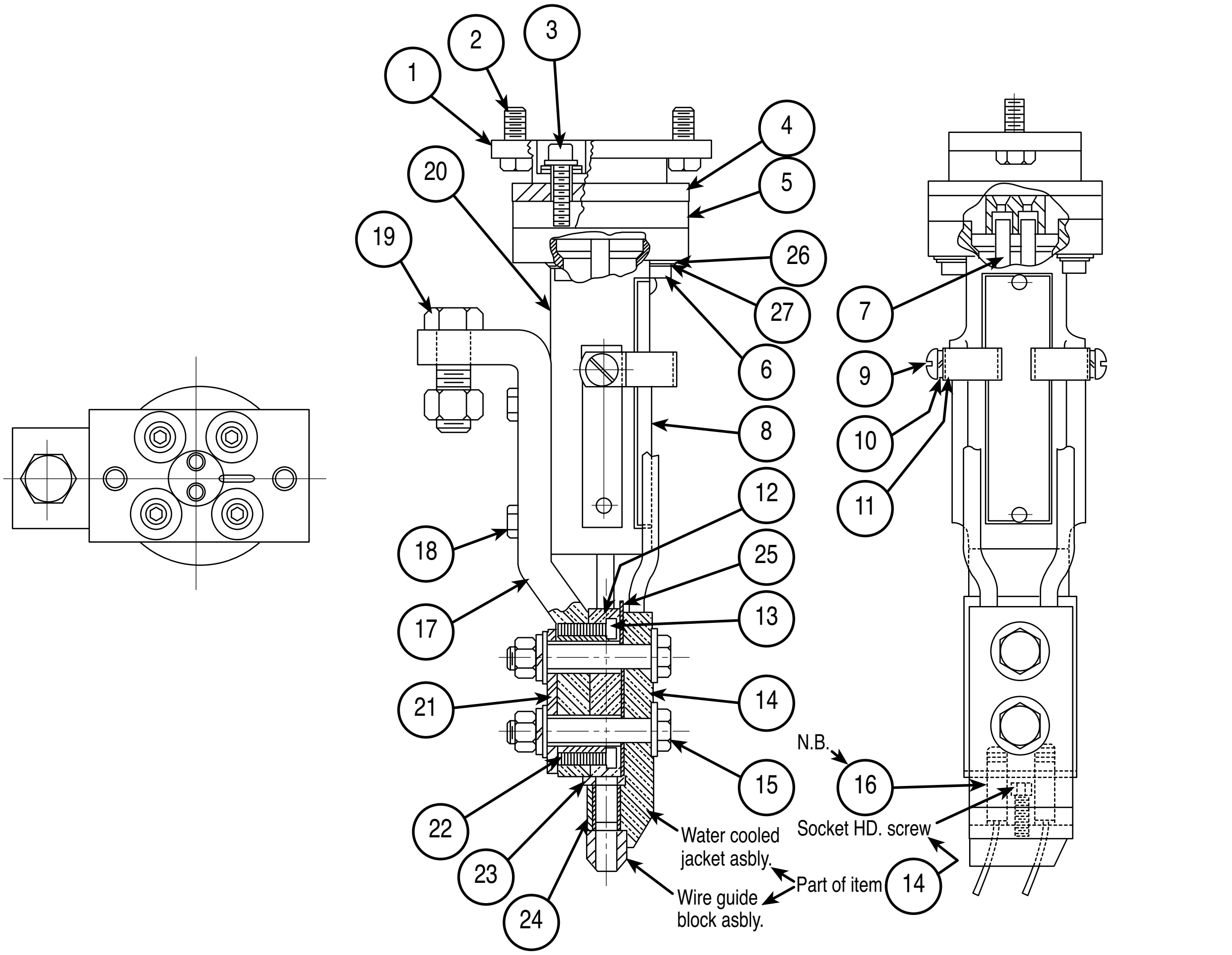


L5314
6-12-81J

Indicates a Change This Printing

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9
	Twinarc - Complete - Includes All Below	K225										
	Nozzle Assembly - Includes Items 101 through 129	L5314-1										
101	Adapter Plate	M12478-1	1									
102	Adapter Insulation	T8391	1									
103	Socket Head Screw	T9447-10	4									
104	Washer	S9262-23	4									
105	Insulating Washer	S10773-12	8									
106	Insulating Bushing	T8390	4									
107	Electrode Guide Tube	KP2084-1	2									
108	Socket Plate	S9842	1									
109	Nozzle Body	M7913	1									
110	Current Bar	S9544	1									
111	1/4-20 x 1.00 HHCS	CF000015	4									
112	Center Contact Block (.375 Electrode Spacing)	T10252-1	1									
112	Center Contact Block (.500 Electrode Spacing)	T10252-2	1									
112	Center Contact Block (.625 Electrode Spacing)	T10252-3	1									
113	Line Up Plate	T10245	1									
114	Socket Head Screw	T9447-11	2									
115	Spring	S7664	2									
116	Spring Insulation	T8724	4									
117	Insulating Bushing	T8725	4									
118	Washer	S9262-23	4									
119	Lock Washer	E106A-2	4									
120	1/4-20 x 1.00 HHCS	CF000015	4									
121	Contact Jaw	T10266	2									
122	1/2-13 x 1.50 HHS	CF000052	1									
123	1/2-13 HN	CF000027	1									
124	Socket Head Screw	T9447-10	2									
125	Washer	T10248	2									
126	Nameplate	S9556	1									
127	Drive Screw	S8025-8	2									
128	Flux Tube Support Assembly	T10684	1									
129	5/16-18 x 3/4 HHCS	CF000049	2									
	Outer Drive Rolls	KP1889-1	2									
	Center Drive Roll	S14905	1									
	Drive Roll Spacer	T12146-1	1									
	Idle Roll Assembly	S13165	1									
	Drive Roll Key	M8776-6	1									
	Wire Guide Tubes - Upper & Lower	KP1982-1	2									
	Wire Straightener	See P-100-M	1									
	Second Wire Reel & Reel Mounting	See P-100-G	1									

K239 INNERSHIELD TWINARC KIT



L5421
3-22-85M

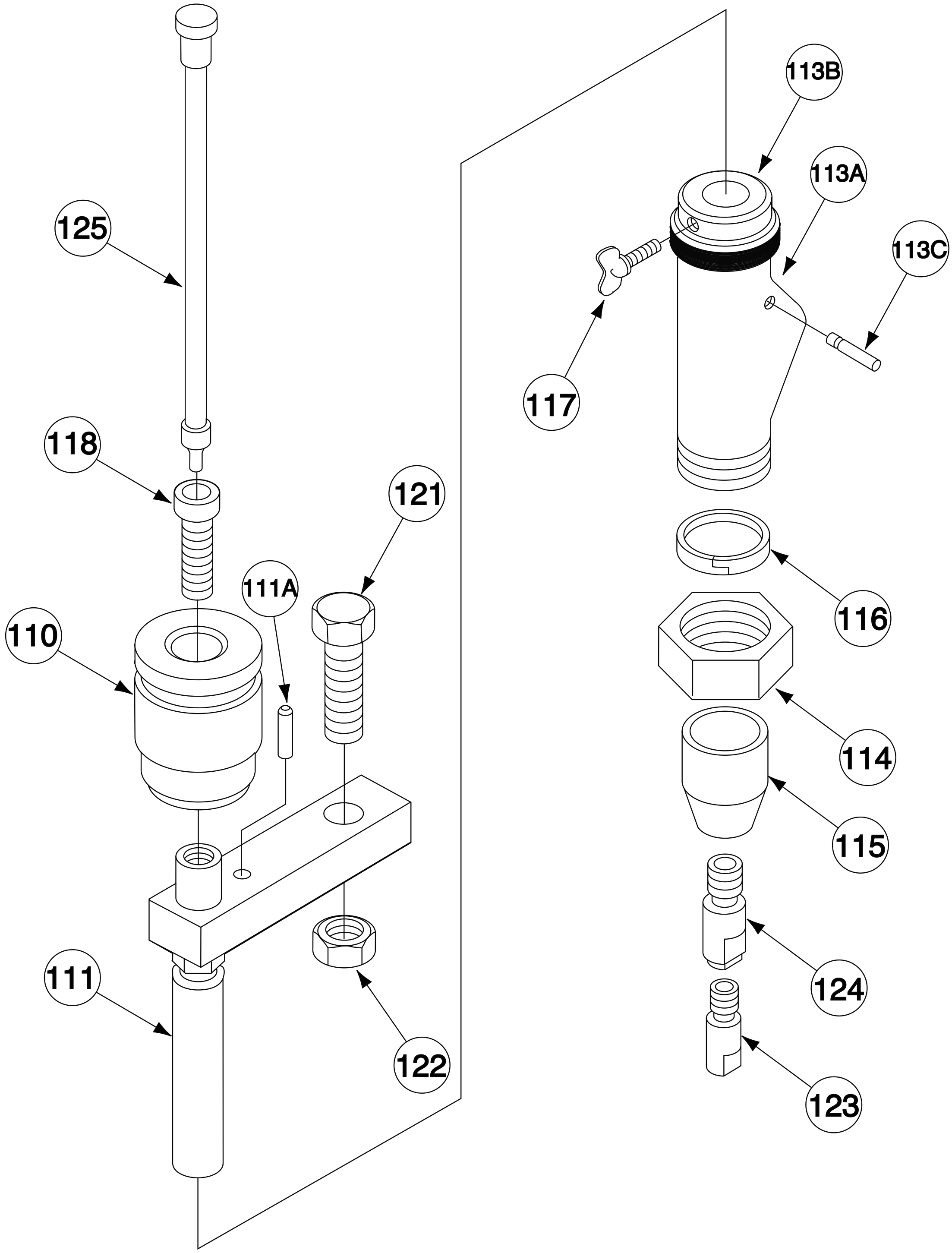
Indicates a Change This Printing

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9
	Twinarc - Complete - Includes All Below	K239										
	Nozzle Assembly	L5421-1 ø										#
1	Adapter Plate & Roll Pin Assembly	M12478-1	1									
2	Hex Head Screw	5/16-18 x .75	2									
3	Socket Head Screw	T9447-10	4									
3	Flat Washer	S9262-23	4									
3	Insulating Washer	S10773-12	8									
3	Insulating Bushing	T8390	4									
4	Adapter Insulation	T8391	1									
5	Socket Plate	S9842	1									
6	Socket Head Screw	T9447-10	2									
7	Electrode Guide Tube	T10251-1	2									
8	Nameplate	S9556	1									
8	Drive Screw	S8025-8	2									
9	Round Head Screw	1/4-20 x .50	2									
10	Lock Washer	E106A-2	2									
11	Clamp	T8970-14	2									
12	Contact Block	S15482-1	1									
13	Socket Head Screw	T9447-7	2									
14	Jacket & Guide Block Assembly	S15487-1	1									
15	Hex Head Screw	3/8-16 x 2.25	2									
15	Flat Washer	S9262-120	4									
15	Lock Washer	E106A-16	2									
15	Hex Nut	3/8-16	2									
16	Contact Tip	T14050-3/32	2									
17	Current Bar	S15483	1									
18	Hex Head Screw	1/4-20 x 1.00	4									
19	Hex Head Screw	1/2-13 x 1.50	1									
19	Hex Nut	1/2-13	1									
20	Nozzle Body	M7913	1									
21	Conductor Bar Insulation	T13831-2	1									
22	Insulating Sleeve	T13829	2									
23	Tip Insulation	T13831-1	1									
24	Insulating Sleeve	T13830-1	2									
25	Water Jacket Insulation	T13832	1									
26	Flat Washer	S9262-23	2									
27	Flat Washer	S9262-103	2									
	Outer Drive Rolls	S14904	2									
	Center Drive Roll	S14905	1									
	Drive Roll Spacer	T12146-1	1									
	Idle Roll Assembly	S13165	1									
	Drive Roll Key	M8776-6	1									
	Wire Guide Tubes - Upper & Lower	S14901	2									
	Wire Straightener	See P-100-N	1									
	Second Wire Reel & Reel Mounting	See P-100-G	1									

Ø This part is obsolete and no longer available.

K231 (and K31*)
CONTACT NOZZLE ASSEMBLY

* For K31, order K231 assembly.
All parts are interchangeable.



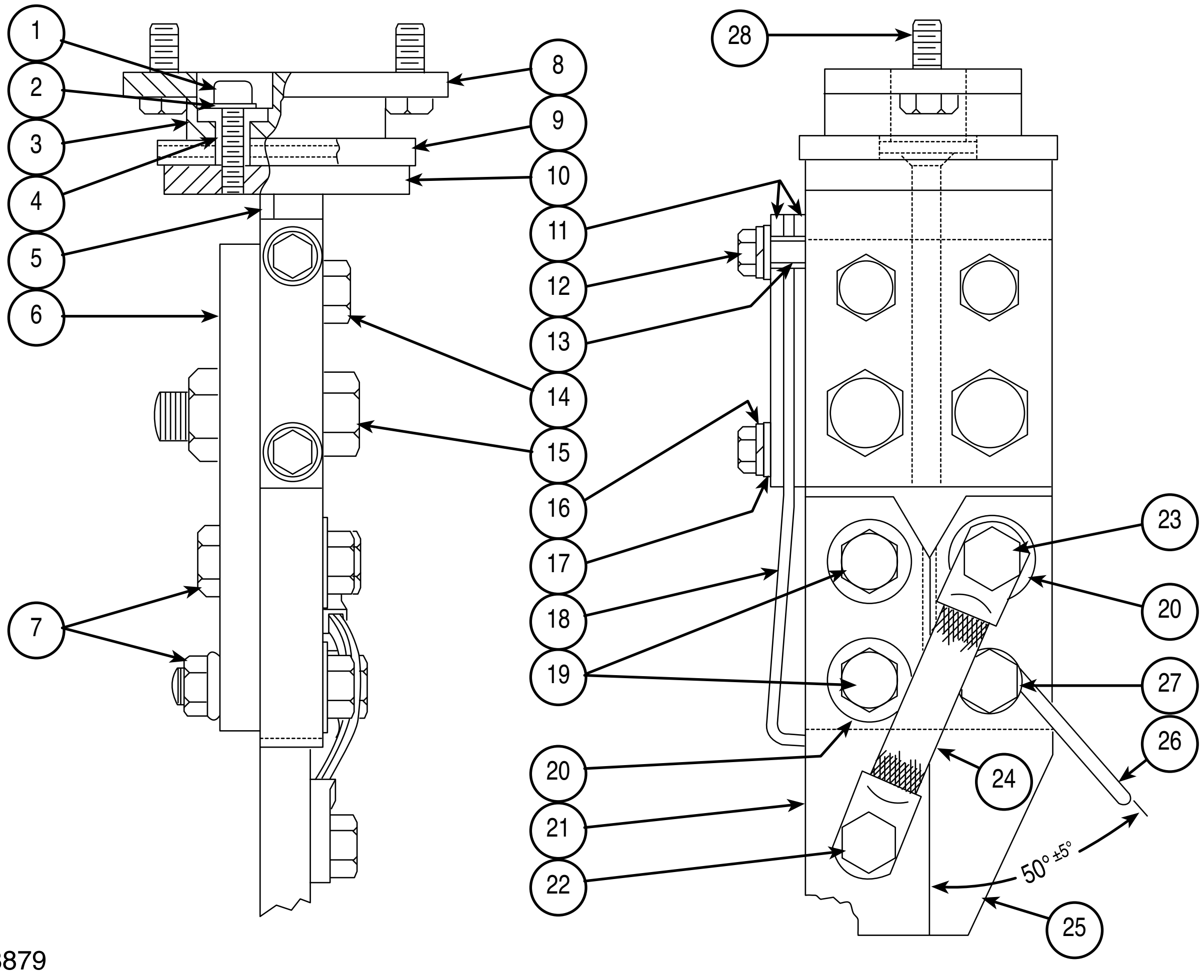
Use only the parts marked “X” in the column under the heading number called for in the model index page.

Indicates a Change This Printing

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9	
	Nozzle Assembly, Includes Items 110 thru 125 as appropriate for wire size specified	K231*	1	X	•								
	Nozzle Assembly, for LT34 ONLY, Includes Items 110, 111, 118, 121 and 122; Order Items 119, 120, 123, 124 and 125 separately for the desired wire size	M8241-1	2	•	X								
110	Nozzle Insulator	S10493-1	1	X	X								
111	Nozzle Body	S10157	1	X	X								
111A	Roll Pin	T9967-10	1	X	X								
113A	Cone Body Assembly, Includes:	M8249	1	X	•								
113B	Flux Cone Plug	S10138	1	X	•								#
113C	Roll Pin	T9967-30	1	X	•								
114	Retaining Nut	S10147	1	X	•								
115	Flux Cone	KP2085-1	1	X	•								
116	Locking Ferrule	T10574	1	X	•								
117	Thumb Screw	T9078-1	1	X	•								
118	Special Socket Head Screw	T10570	1	X	•								
119	Rubber Flux Tube (Not Shown)	T10642-1	1	X	•								
119	Rubber Flux Tube, LT34 Only (Not Shown)	T10642-11	1	•	X								
120	Steel Flux Tube (Not Shown)	T6996-9	1	X	•								
120	Steel Flux Tube, LT34 Only (Not Shown)	S10487	1	•	X								
121	1/2-13 x 1.50 HHCS - Lead to Nozzle	CF000052	1	X	X								
122	1/2-13 HN - Lead to Nozzle	CF000027	1	X	X								
123	Contact Tip - 7/32 Wire Size	KP1962-5	1	X	X								
123	Contact Tip - 3/16 Wire size	KP1962-2	1	X	X								
123	Contact Tip - 5/32 Wire Size	KP1962-4	1	X	X								
123	Contact Tip - 1/8 Wire Size	KP1962-1	1	X	X								
123	Contact Tip - 3/32 Wire Size	KP1962-3	1	X	X								
123	Contact Tip - 3/32 Wire Size; (3/8-24 Thread) Old Style	KP2082-1	1	X	X								
123	Contact Tip - 3/32 Wire Size; (5/16-18 Thread)	KP2100-3	1	X	X								
123	Contact Tip - 5/64 Wire Size; (3/8-24 Thread) Old Style	KP2082-2	1	X	X								
123	Contact Tip - 5/64 Wire Size; (5/16-18 Thread) See Note 1	T14050-5/64	1	X	X								
124	Adapter for 3/32 and 5/64 S8087 Tips (With 3/8-24 Female Thread)	See Note 2	1	X	X								
124	Adapter for 3/32 and 5/64 T14050 Tips (With 5/16-18 Female Thread)	KP1992-1	1	X	X								
125	Nozzle Insert for 3/32 and 5/64 Wire (For NA)	S15106-3/32	1	X	•								
125	Nozzle Insert for 5/64 Wire (For LAF & LT)	KP2121-2	1	X	X								
	Mounting Clip (For Mounting Nozzle on LAF2)	T10714 ø	2	X	•								
	Nozzle Extension (5.38” long) (For 3/32 & Larger Wire)	S12003	As Req’d	X	•								
*	Specify Wire Size												
Note 1	When tip life is limited by tip being fused over, the use of T14726-5/64 Tips may result in a lower overall cost.												
Note 2	This adapter is no longer available, order Adapter S16844 and the appropriate T14050 Tips or T14726-5/64 Tip.												

K226 (and K32*)
CONTACT JAW ASSEMBLY

* For K32, order a K226 assembly.
All parts are the same except Item 8.



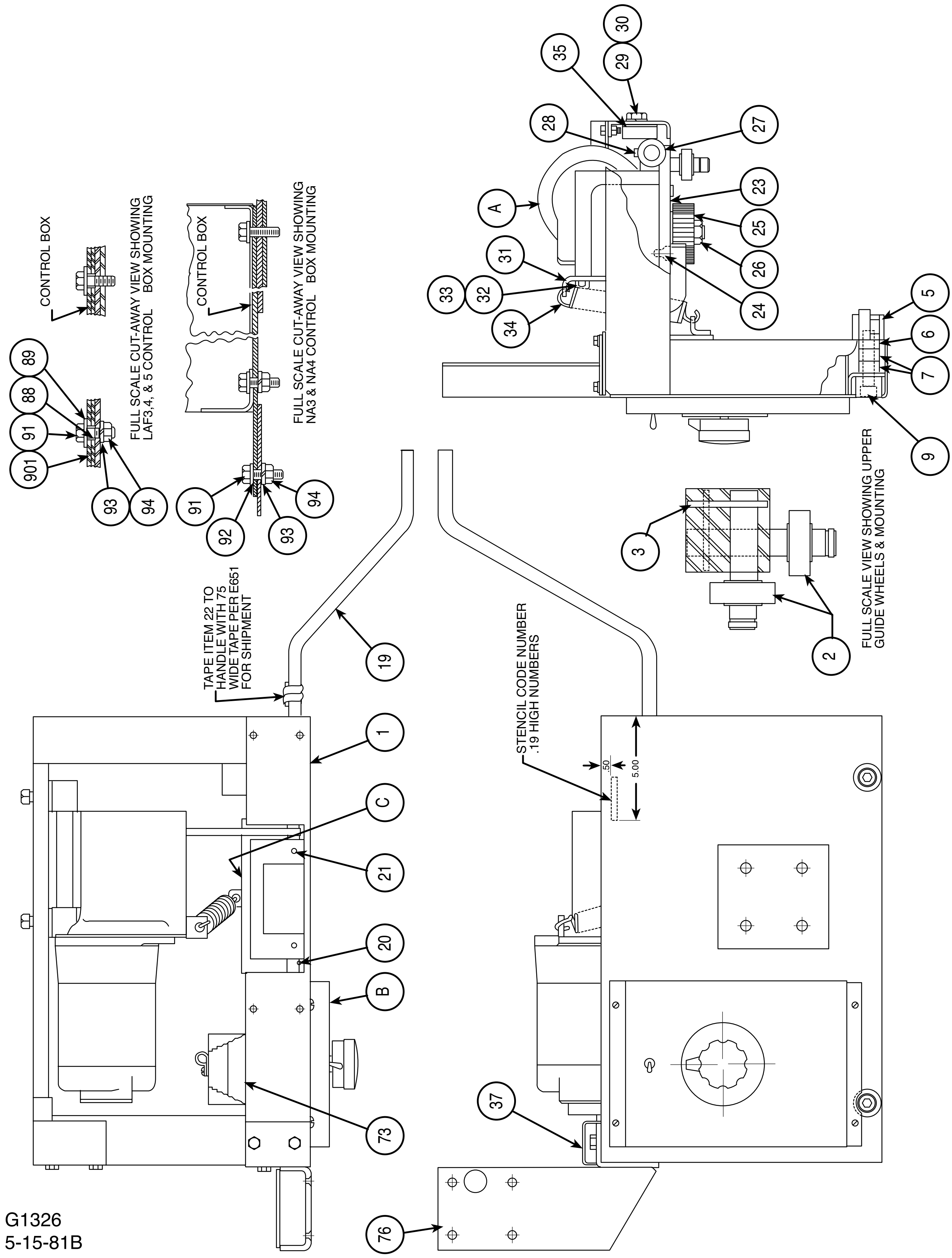
M13879
6-12-81J

Indicates a Change This Printing

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9
	Contact Jaw Assembly - One Rectangular and One Tapered Jaw - For 1/8 thru 7/32 Wire, Includes:	K226-R	1									
	Contact Jaw Assembly - Two Tapered Jaws - For 3/32 and 1/8 Wire, Includes:	K226-T	1									
1	Socket Head Screw	T9447-10	4									
2	Washer	S9262-23	4									
3	Insulating Washer	S10773-12	8									
4	Insulating Bushing	T8390	4									
5	Cover Plate	T8404	1									
6	Lead Block	S7273	1									
7	Hex Jam Nut	3/8-16	4									
8	Adapter Plate, Rectangular*	M12478*	1									
9	Insulation Plate	T8391	1									
10	Bottom Wire Guide	M6656	1									
11	Spring Insulation	T8724	2									
12	Hex Head Cap Screw	1/4-20 x 1.00	2									
13	Insulating Bushing	T8725	2									
14	Hex Head Cap Screw	3/8-16 x 1.00	2									
15	Hex Head Cap Screw	1/2-13 x 1.75	2									
15N	Hex Jam Nut	1/2-13	2									
16	Lock Washer	E106A-2	2									
17	Plain Washer	S9262-23	2									
18	Spring	S7664	1									
19	Hex Head Cap Screw	3/8-16 x 1.25	2									
20	Plain Washer	S9262-4	2 or 3									
21	Contact Block - Rectangular	S16640-1	1									
21	Contact Block - Tapered	S16640-2	1									
22	Hex Head Cap Screw (K226-R Only)	3/8-16 x .75	1									
23	Hex Head Cap Screw (K226-R)	3/8-16 x 1.50	1									
23	Hex Head Cap Screw (K226-T)	3/8-16 x 1.25	1									
24	Braided Lead (K226-R Only)	S7266	1									
25	Contact Jaw	S16640-2	1									
26	Flux Tube Clip	T10683	1									
27	Hex Head Cap Screw	3/8-16 x 1.50	1									
28	Hex Head Screw	5/16-18 x .75	2									
29	Flux Hose	T10642-2	1									
30	Flux Hose Tip	S7748-35	1									
*	**Item** 8 for K32 Jaws Sold with LAF and LT3 Tractors was round – Part S7258.											

P-101-P
(Supersedes P-52-C)

TRAVEL CARRIAGE GENERAL ASSEMBLY



G1326
5-15-81B

P-101-P.1.a
(Supersedes P-52-C.1)

\# Indicates a Change This Printing

For K23 & K236 Models (below code 7500), use the parts marked “X” in Column 1.
For K247 Models (above code 7500), use the parts marked “X” in Column 2.
For K247-HC Models (above code 7500), use the parts marked “X” in Column 3.

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9	
A	Motor and Gear Box Assembly	See P-101-R											
B	Control Panel Assembly	See P-101-O											
1	Carriage Frame	G1384	1	X	X	X							
2	Upper Guide Wheel Assembly, Includes:	T5335-1	4	X	•	•							
2	Upper Guide Wheel Assembly, Includes:	T13876	4	•	X	•							
2	Upper Guide Wheel Assembly, Includes:	T13875	4	•	•	X							
	Shaft	T10647	1	X	•	•							
	Shaft	S15558	1	•	X	X							
	Bearing	M9300-6	1	X	X	•							
	Bearing	M9300-67	1	•	•	X							
	Retaining Ring	S9776-50	2	•	X	X							
3	Roll Pin	T9967-43	4	•	X	X							
	Lockwasher - Guide Wheel Mounting	E106A-5	6	X	•	•							
	Washer - Guide Wheel Mounting	S9262-1	8	X	•	•							
5	Lower Bearing Bar Assembly	S10299	2	X	•	•							
5	Lower Bearing Bar Assembly	M12980-2	2	•	X	•							
5	Lower Bearing Bar Assembly	M12980-1	2	•	•	X							
6	Spacer - Thin	S10262-1 ø	4	X	•	•							
6	Spacer - Thin	S10262-5	4	•	X	X							
7	Spacer - Thick	S10262-2 ø	8	X	•	•							
7	Spacer - Thick	S10262-4	2	•	X	•							
	Lockwasher, Lower Bearing Bar Mounting	E106A-4	4	X	•	•							
9	Socket Head Screw	T9447-14 ø	4	X	•	•							#
9	Socket Head Screw	T9447-49	2	•	X	X							
C	Head Mounting and Lift	L3116	1	X	•	•							
C	Head Mounting and Lift	L5460	1	•	X	X							
	Head Mounting Parts	See P-101-Q	1	X	X	X							
19	Lift Handle	M8385	1	X	•	•							
19	Lift Handle	M12968	1	•	X	X							
20	Lift Handle Stud	T10652	1	X	•	•							
20	Lift Handle Stud	T13872	1	•	X	X							
21	Set Screw, Lift Handle and Stud Mounting	S11604-11	2	X	•	•							
	Hex Jam Nut, Locking Set Screw	3/8-16	1	X	•	•							
21	Roll Pin, Lift Handle Mounting	T9967-30	1	•	X	X							
22	Roller, Mounts Item C thru Crank Bracket	T8128	1	X	X	X							
23	Gear Box Mounting Plate	M8485 ø	1	X	X	X							
24	Flat Head Screw	5/16-18 x .625	4	X	X	X							
25	Drive Wheel	T13586	1	X	X	X							
	Key, Drive Wheel to Motor	M8776-6	1	X	X	X							
	Spacer	S9262-44	1	X	X	X							
	Lockwasher	T9860-2	1	X	X	X							
26	Nut, Drive Wheel to Motor	T10552	1	X	X	X							
27	Swivel Motor Mount	S10288	2	X	X	•							
27	Swivel Motor Mount	S15772	2	•	•	X							
28	Oil Cup	T8679	2	X	X	X							
29	Hex Head Bolt	1/2-13 x 1.00	2	X	•	•							
29	Hex Head Bolt	1/2-13 x 1.25	2	•	X	X							
30	Lockwasher	E106A-5	2	X	X	X							
31	Upper Spring Bracket	S10379	1	X	X	X							
32	Hex Head Bolt	3/8-16 x .75	2	X	X	X							

Ø This part is obsolete and no longer available.

P-101-P-1.b
(Supersedes P-52-C.1)

Indicates a Change This Printing

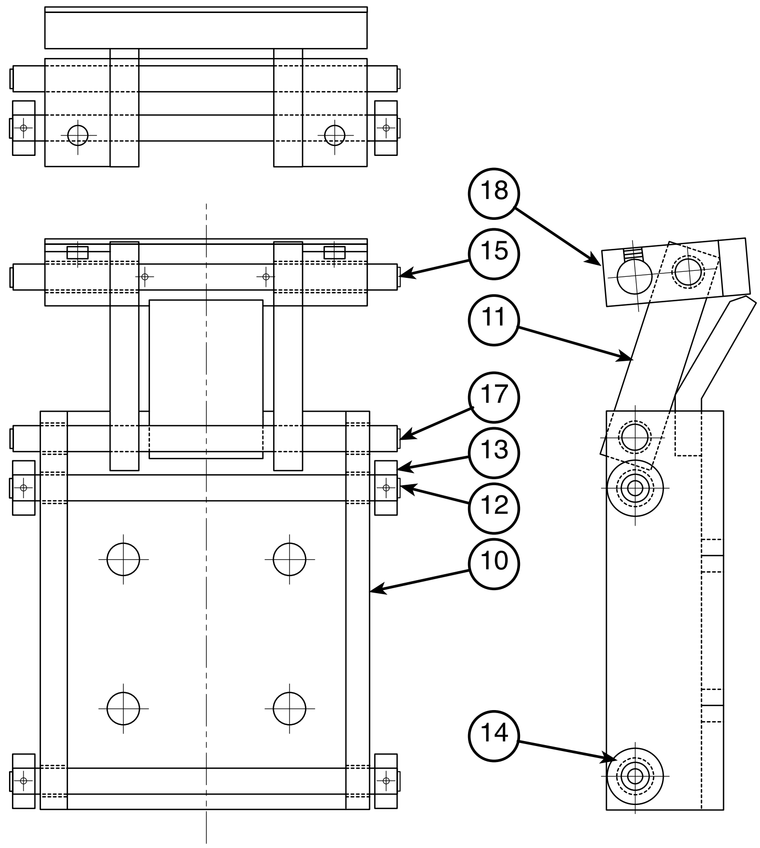
For K23 & K236 Models (below code 7500), use the parts marked "X" in Column 1.
For K247 Models (above code 7500), use the parts marked "X" in Column 2.
For K247-HC Models (above code 7500), use the parts marked "X" in Column 3.

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9
33	Lockwasher	E106A-4	2	X	X	X						
34	Spring	T5338	1	X	X	X						
35	Shim - Swivel Motor Mount	T10778-1	As Req'd	X	X	X						
35	Shim - Swivel Motor Mount	T10778-2	4	X	X	X						
37	Cable Clamp	M8501	1	X	X	X						
73	Choke Coil	M8424	1	X	X	X						
	Cable - To Travel Receptacle in Control Box, Includes:	M8377	1	X	X	X						
	Plug	S10272	1	X	X	X						
76	Wire Reel Support	L3154	1	X	X	X						
	Control Box Mounting Parts											
88	Insulation Tube	T7305-19	4	X	X	X						
89	Insulation Washer	S10773-12	4	X	X	X						
90I	Insulation Spacer	S10300	1	X	X	X						
90A	Adapter Plate	S15082	1	X	X	X						
91	Hex Head Screw	1/4-20 x .75	6	X	X	X						
92	Plain Washer	S9262-98	6	X	X	X						
93	Lockwasher	E106A-2	6	X	X	X						
94	Hex Nut	1/4-20	6	X	X	X						

Carriage Type Number			Gear Ratio
For LAF & NA2	For NA3 & NA4	For NA3 & NA4	
K23-F	K236-F	K247 & -HC -F	Fast 144 : 1
K23-M	K236-M	K247 & -HC -M	Medium 324 : 1
K23-S	K236-S	K247 & -HC -S	Slow 648 : 1

P-101-Q
(Supersedes P-52-D)

HEAD MOUNTING AND LIFT MECHANISM



Indicates a Change This Printing

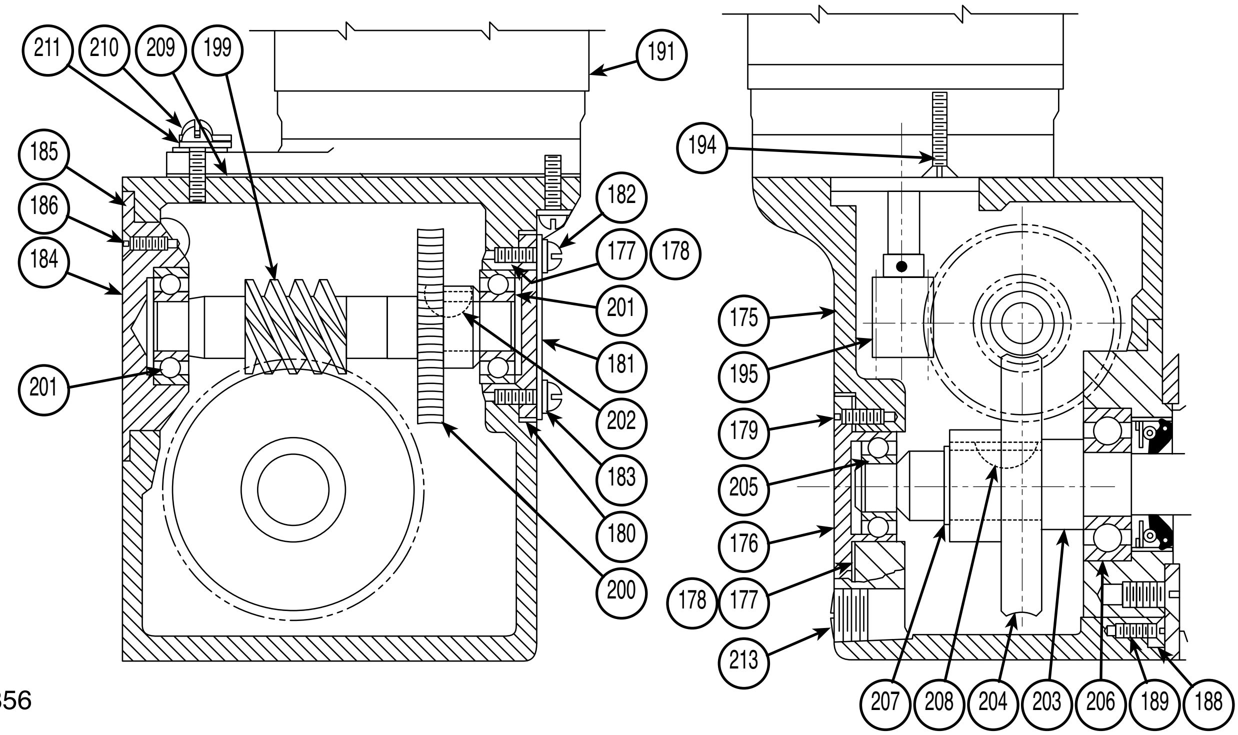
For K23 and K236 Models (Below Code 7500) use the parts marked "X" in column 1.
For K247 and K247-HC Models, (Above Code 7500) and K325 and K325-HC Models, use the parts marked "X" in column 2.

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9	
C	Head Mounting and Lift Mechanism (Includes all Below)	L3116	1	X	•								
C	Head Mounting and Lift Mechanism (Includes all Below)	L5460	1	•	X								
10	Head Lift Mounting Plate	S10292	1	X	•								
10	Head Lift Mounting Plate	S15553	1	•	X								
11	Lift Link	S10296	2	X	•								
11	Lift Link	S15552	2	•	X								
12	Roller Shaft	S10266-1	2	X	X								
13	Roller	T10654	4	X	X								
14	Roll Pin - Roller to Roller Shaft	T9967-6	4	X	X								
15	Crank Link Shaft	S10266-3 ø	1	X	•								#
15	Crank Link Shaft	S10266-4	1	•	X								
16	Roll Pin - Locates Lift Link on Crank Link Shaft	T9967-1	4	X	X								
17	Link Shaft	S10266-2 ø	1	X	•								#
17	Link Shaft	S10266-4	1	•	X								
18	Crank Bracket	S10285 ø	1	X	•								#
18	Crank Bracket	T13874	1	•	X								

Ø This part is obsolete and no longer available.

P-101-R
(Supersedes P-52-F)

CARRIAGE DRIVE MOTOR AND GEAR CASE



A-356

Indicates a Change This Printing

Use only the parts marked "X" in the column under the heading number called for in the model index page.

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9	
A	Drive Motor and Gear Case Assembly, 144-1 Ratio, Includes All items in Column 1 Marked "X".	L3094-1* ø	1	X	•	•							
A	Drive Motor and Gear Case Assembly, 324-1 Ratio, Includes All items in Column 2 Marked "X".	L3094-2*	1	•	X	•							
A	Drive Motor and Gear Case Assembly, 648-1 Ratio, Includes All items in Column 3 Marked "X".	L3094-4* ø	1	•	•	X							
175	Gear Case	G1027 ø	1	X	X	X							#
176	Dust Cap - For Output Shaft	T10559	1	X	X	X							
177	Dust Cap Gasket	T10649-1	As Req'd	X	X	X							
178	Dust Cap Gasket	T10649-2 ø	As Req'd	X	X	X							
179	Flat Head Screw - Dust Cap to Case	10-24 x 1/2	4	X	X	X							
180	Dust Cap - For Cross Shaft	T10672 ø	1	X	X	X							#

Ø This part is obsolete and no longer available.

Use only the parts marked "X" in the column under the heading number called for in the model index page.

Indicates a Change This Printing

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9	
181	Caution Plate	S10346	1	X	X	X							
182	Round Head Screw - Dust Cap to Gear Case	#10-24 x 1/2	4	X	X	X							
183	Lock Washer	E106A-1	4	X	X	X							
184	Small Bearing Cage	S10077	1	X	X	X							
185	Small Bearing Cage Gasket	S10084	1	X	X	X							
186	Flat Head Screw - Small Cage to Gear Case	#10-24 x 1/2	4	X	X	X							
187	Large Bearing Cage	S10079	1	X	X	X							
188	Large Bearing Cage Gasket	S10085	1	X	X	X							
189	Flat Head Screw - Large Cage to Gear Case	#10-24 x 1/2	6	X	X	X							
190	Oil Seal - Output Shaft	S7611-5	1	X	X	X							
	Motor Assembly - 144-1 Ratio Only, Includes:	M10301-2	1	X	•	•							
	Motor Assembly - 324-1 and 648-1 Ratio, Includes:	M10301-1	1	•	X	X							
191	Motor	**NSS**	1	X	X	X							
	Brush and Spring Assembly	L3117-9 ø	2	X	X	X							#
	Brush Cap	L3117-7 ø	2	X	X	X							#
	Phillips Flat Head Screw, Motor to Base	8-32 x 1	4	X	X	X							
	Input Worm, 144-1 Ratio Only	S10088-3	1	X	•	•							
	Input Worm, 324-1 and 648-1 Ratio	S10088-1	1	•	X	X							
	Roll Pin, Input Worm to Motor Shaft	T9967-3	1	X	X	X							
	Four Contact Plug	T10662	1	X	X	X							
	Oil Throw Ring	S10773-6	1	X	X	X							
	Cross Shaft Assembly, 144-1 Ratio Only, Includes Items 199 through 202	S10080-3 ø	1	X	•	•							#
	Cross Shaft Assembly, 324-1 Ratio Only, Includes Items 199 through 202	S10080-6	1	•	X	•							
	Cross Shaft Assembly, 628-1 Ratio Only, Includes Items 199 through 202	S10080-8	1	•	•	X							
199	Cross Shaft, 224-1 Ratio Only	S10075-3 ø	1	X	•	•							
199	Cross Shaft, 324-1 Ratio Only	S10075-4	1	•	X	•							
199	Cross Shaft, 648-1 Ratio Only	S10075-2	1	•	•	X							
200	Input Worm Gear, 144-1 Ratio Only	S10087-3	1	X	•	•							
200	Input Worm Gear, 224-1 and 648-1 Ratio	S10087-1	1	•	X	X							
201	Ball Bearing	M9300-29	2	X	X	X							
202	Woodruff Key	#405	1	X	X	X							
	Output Shaft Assembly, 144-1 Ratio Only, Includes Items 203 through 208	S10083-3 ø	1	X	•	•							
	Output Shaft Assembly, 324-1 Ratio Only, Includes Items 203 through 208	S10083-4	1	•	X	•							
	Output Shaft Assembly, 648-1 Ratio Only, Includes Items 203 through 208	S10083-2	1	•	•	X							
203	Output Shaft	S10078	1	X	X	X							
204	Output Shaft Worm Gear, 144-1 Ratio Only	S10076-3 ø	1	X	•	•							
204	Output Shaft Worm Gear, 324-1 Ratio Only	S10076-4	1	•	X	•							
204	Output Shaft Worm Gear, 648-1 Ratio Only	S10076-2	1	•	•	X							
205	Ball Bearing	M9300-27	1	X	X	X							
206	Ball Bearing	T10776	1	X	X	X							
207	Snap Ring	S9776-5	1	X	X	X							
208	Woodruff Key	#606	1	X	X	X							
209	Motor Base Gasket	T8364	1	X	X	X							
210	Round Head Screw, Motor Base to Gear Case	#10-24 x 3/4	3	X	X	X							
211	Lock Washer, Motor Base to Gear Base	E106A-1	3	X	X	X							
213	Slotted Pipe Plug	S10780-5 ø	1	X	X	X							
	Gear Box Lubricant	T8484	1	X	X	X							
	* To order a gear box assembly without a motor, add "-W" to this assembly number.												

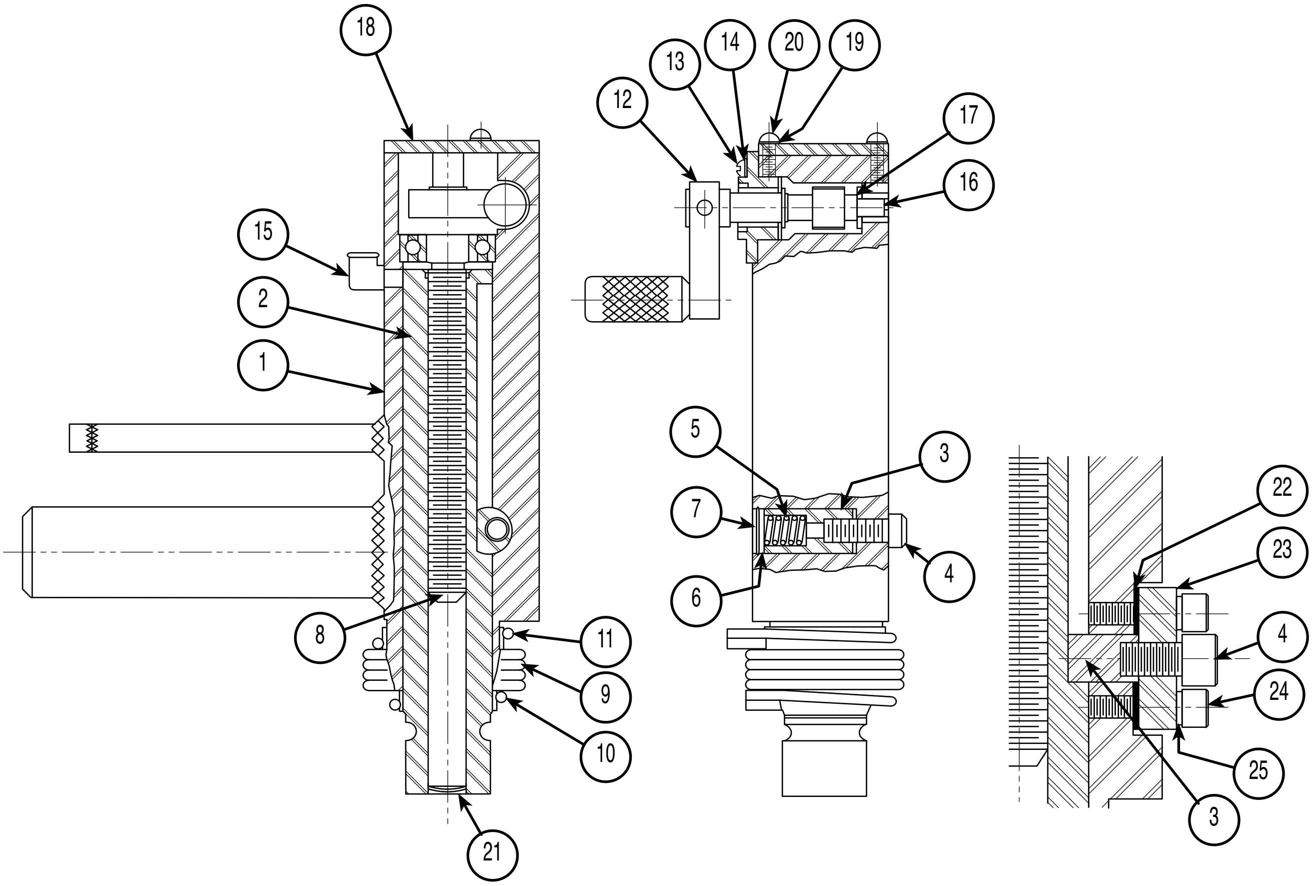
Ø This part is obsolete and no longer available.

NSS - Not sold separately.

02-20-2002

K29 VERTICAL HEAD LIFT ASSEMBLY

NA1, 2, 3, 4 and 5 and LAF3, 4 and 5



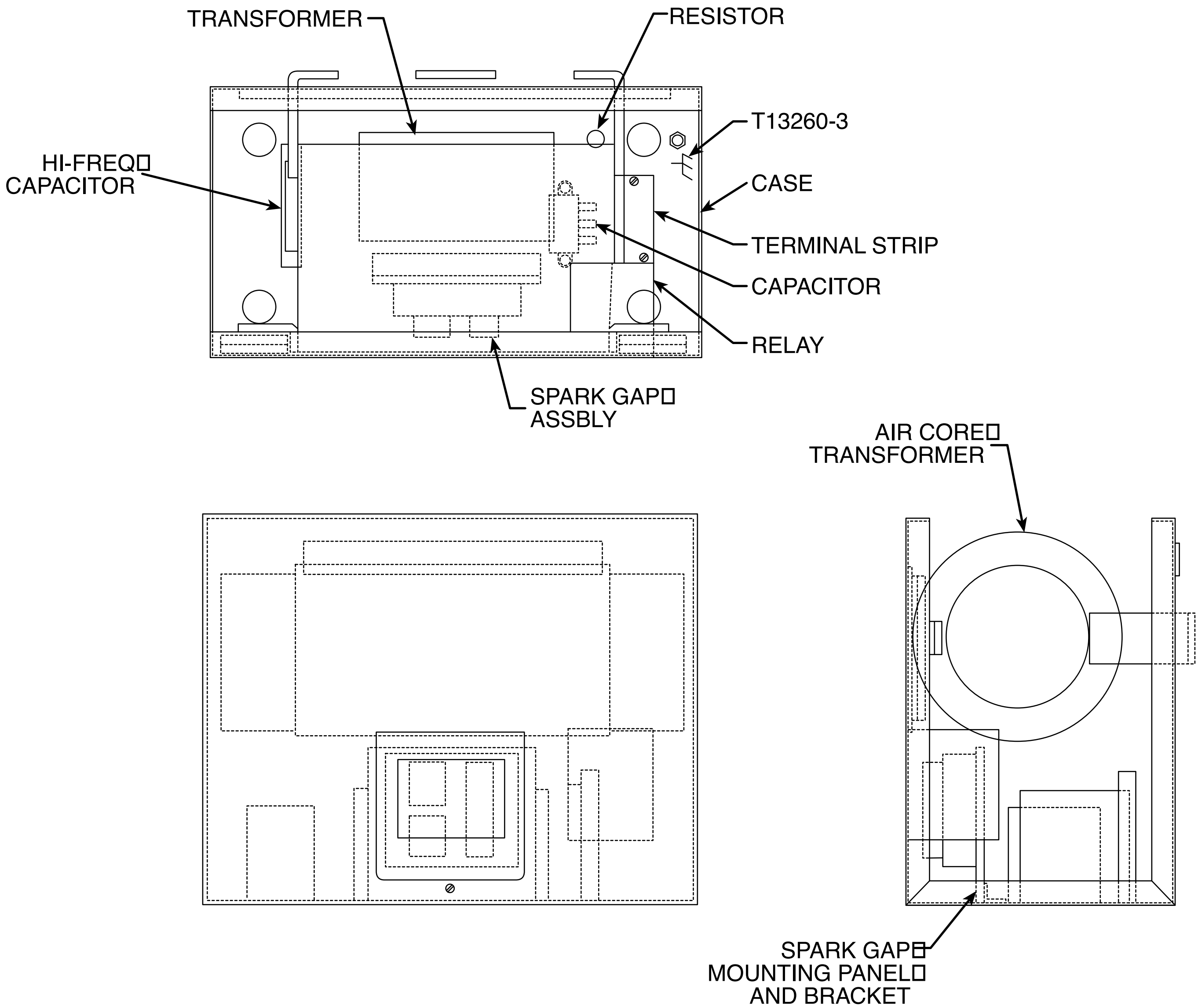
L5882
11-13-81P

\# Indicates a Change This Printing

In mid 1978 the K29 was redesigned. Old design assemblies may be identified by three socket head screws in the head lift lock area. New design assemblies have only one socket head screw. Use parts marked "X" in Column 1 for old design. Use parts marked "X" in Column 2 for new design.

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9
1	Head Lift Housing	K29	1	X	•							
1	Head Lift Housing	L5881	1	•	X							
2	Head Lift Tube	M8228	1	X	•							
2	Head Lift Tube	M8228-1	1	•	X							
3	Head Lift Lock Pin	S16067	1	•	X							
3	Locating Key	T12121	1	X	•							
4	Socket Head Cap Screw	T9447-34	1	X	•							
4	Socket Head Cap Screw	T9447-32	1	•	X							
5	Spring	T10247-11	1	•	X							
6	Spring Retainer	S11295-5	1	•	X							
7	Snap Ring	S9776-14	1	•	X							
8	Head Lift Screw Assembly, Includes:	S10114	1	X	X							
	Head Lift Screw	S10094	1	X	X							
	Ball Bearing	M9300-6	1	X	X							
	Snap Ring	S9776-3	1	X	X							
	Gear	S10096-1	1	X	X							
	Woodruff Key	#404	1	X	X							
9	Boot	S10442	1	X	X							
10	Clamp	S10888-11	1	X	X							
11	Clamp	S10888-8	1	X	X							
12	Adjusting Shaft Assembly, Includes:	S10097	1	X	X							
	Crank Arm Assembly	T10543	1	X	X							
	Snap Ring	S9776-3	1	X	X							
	Thrust Washer	S9262-38	1	X	X							
	Drive Pin	T8433	1	X	X							
	Shaft	T10544	1	X	X							
	Bearing Retainer	S10093	1	X	X							
	Needle Bearing	S7844	1	X	X							
	Oil Seal	S7611-13	1	X	X							
13	Round Head Screw	#10-24 x .50	2	X	X							
14	Lock Washer	E106A-1	2	X	X							
15	Oil Cup	T10643	1	X	X							
16	Needle Bearing	S10116-1	1	X	X							
17	Thrust Washer	S9262-37	1	X	X							
18	Cover Plate	T14606	1	X	X							
19	Lock Washer	E106A-1	2	X	X							
20	Round Head Screw	#10-24 x .50	2	X	X							
21	Expansion Plug	T10542-1	1	X	X							
22	Shim	T10601	As Req'd	X	•							
23	Locking Plate	T12120	1	X	•							
24	Socket Head Cap Screw	T9447-33	2	X	•							
25	Lock Washer	E106A-2	2	X	•							

HIGH FREQUENCY UNIT K238



L6329
10-21-83

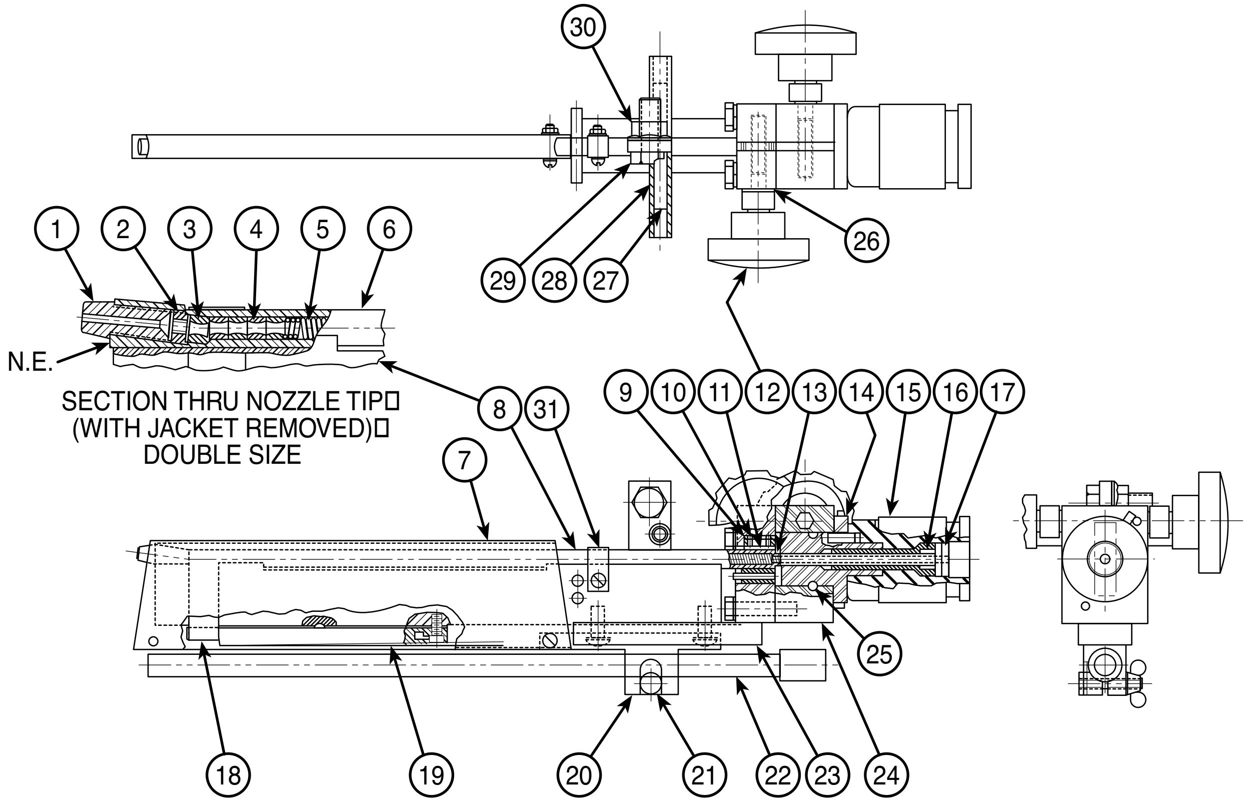
 P-101-T.b

Indicates a Change This Printing

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9	
	High Frequency Unit, Includes:	K238	1										
	Capacitor	S17571	1										
	Transformer	M15359 ø											#
	Resistor	S10404-53	1										
	Case	L3815-1	1										
	Case Cover	L3816	1										
	Nameplate	M9591	1										
	Terminal Strip	S13323-1	1										
	Number Plate	T10726-92	1										
	Relay	S12807	1										
	Spark Gap Assembly	S16501-3	1										
	Electrode	T11236-1	4										#
	R. F. Choke	T12218-1	2										
	Air Core Transformer	L4283	1										

Ø This part is obsolete and no longer available.

K386 NARROW GAP DEEP GROOVE SUBMERGED ARC NOZZLE



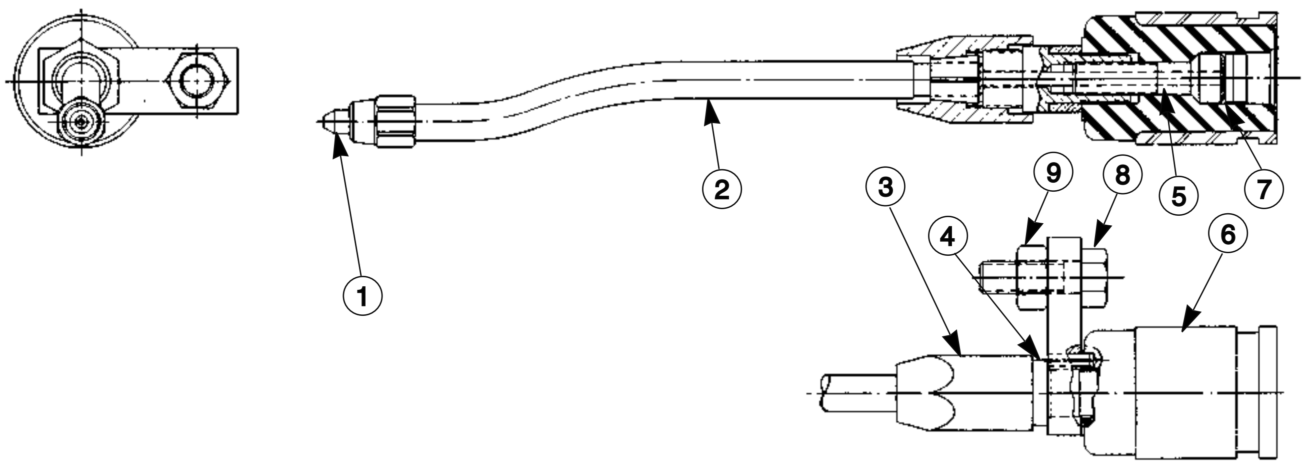
G1653
5-18-84

P-101-U.b

Indicates a Change This Printing

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9	
1	Nozzle Tip	T14879-3/32	1										
2	Hollow Set Screw	T12932-2	1										
3	Ceramic Insert	T12576-1	1										
4	Ceramic Insert	T12576-2	4										
5	Spring Liner	T12931-35	1										
6	Nozzle Tube Assembly	S17543	1										
7	Insulation Jacket	S17545	1										
8	Cooling Bar Assembly	S17546	1										
9	Nozzle Pivot Hub Assembly	T14891	1										
10	Set Screw	S11604-42	2										
11	Key	M8776-89	1										
12	Rotational Lock Screw Assembly	T14885	2										
13	Snap Ring	S9776-46	1										
14	Pivot Assembly	T14883	1										
15	Nozzle Insulator Assembly	S10493	1										
16	Socket Head Screw	T10570	1										
17	Nozzle Insert Assembly	S15106-1	1										
18	Pressure Belt	T14889	1										
19	Pressure Arm Assembly	T14890	1										
	Socket Head Cap Screw	T9447-56	1										
20	Flux Tube Clamp	S17542	1										
	Button Head Socket Screw	T11551-6	2										
21	Hex Head Screw	1/4-20 x 1.25	1										
	Plain Washer	S9262-23	1										
	Wing Nut	T9968-1	1										
22	Flux Tube	T14887	1										
23	Pivot Housing Arm	M14717	1										
	Lock Washer	E106-A14	3										
	Hex Head Screw	5/16-18 x 1.50	3										
24	Mounting Clamp Assembly	S17550	1										
25	Roll Pin	T9967-43	1										
26	Plain Washer	S9262-104	2										
27	Roll Pin	T9967-29	1										
28	Pivot Handle	T14939-1	2										
29	Hex Head Screw	1/2-13 x 1.25	1										
30	Flange Nut	T3960	1										
31	Nozzle Tube Strap	T14974	1										#
	Items Not Illustrated:												
	Flux Hopper Extension Bracket	S17558	2										
	Flux Hopper Extension Pin	S17559	2										
	Extension Pin Nut	1/4-20	2										
	Flex Tube	T10642-106	1										

K405 AUTOMATIC INNERSHIELD NOZZLE



L7102
5-17-85

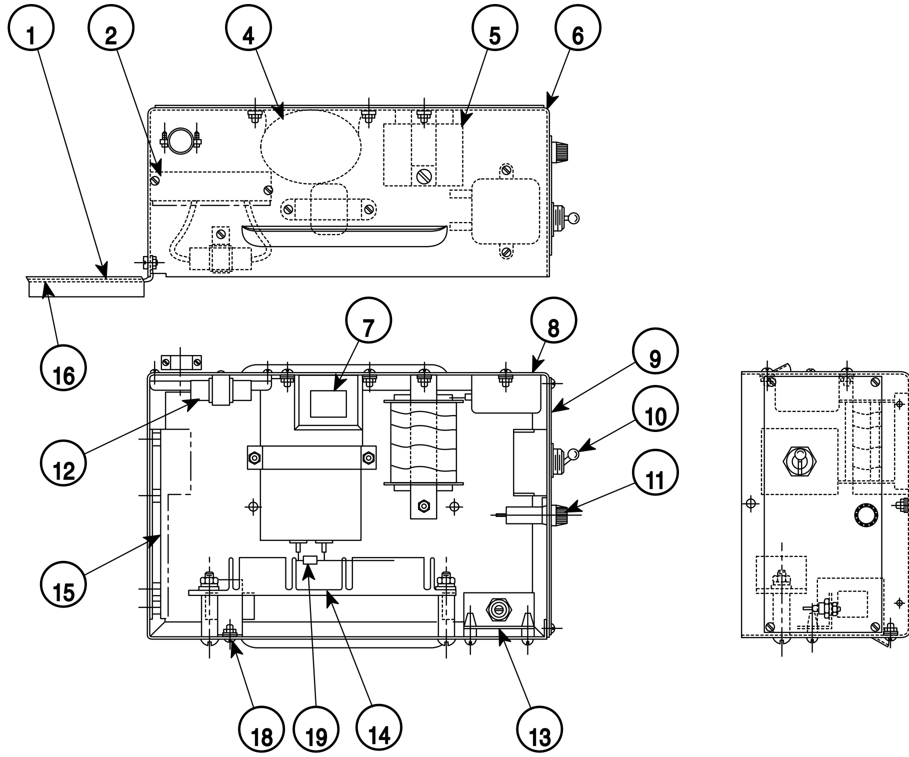
Indicates a Change This Printing

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9	
1	Nozzle Tip - .062 Wire Size	S17614-062	1										
1	Nozzle Tip - .068 Wire Size	S17614-068	1										
1	Nozzle Tip - 5/64 Wire Size	S17614-5/64	1										
1	Nozzle Tip - 3/32 Wire Size	S17614-3/32	1										
1	Nozzle Tip - .120 Wire Size	S17614-120	1										
2	Straight Nozzle Assembly .062 - 3/32 Wire Size	M14808-1	1										
2	Straight Nozzle Assembly .122 Wire Size	M14808-4 ø	1										#
3	Collar	S17745	1										
4	Nozzle Body Assembly	S10157-3	1										
5	Socket Head Screw	T10570	1										
6	Nozzle Insulator Assembly	S10493	1										
7	Nozzle Insert Assembly .062 - 3/32 Wire Size Only	S15106-1	1										
8	Hex Head Screw	1/2-13 x 1.50	1										
9	Hex Nut	1/2 - 13	1										

Ø This part is obsolete and no longer available.

NOTES

K224 SOLID-STATE REMOTE FIELD CONTROL (DISCONTINUED)



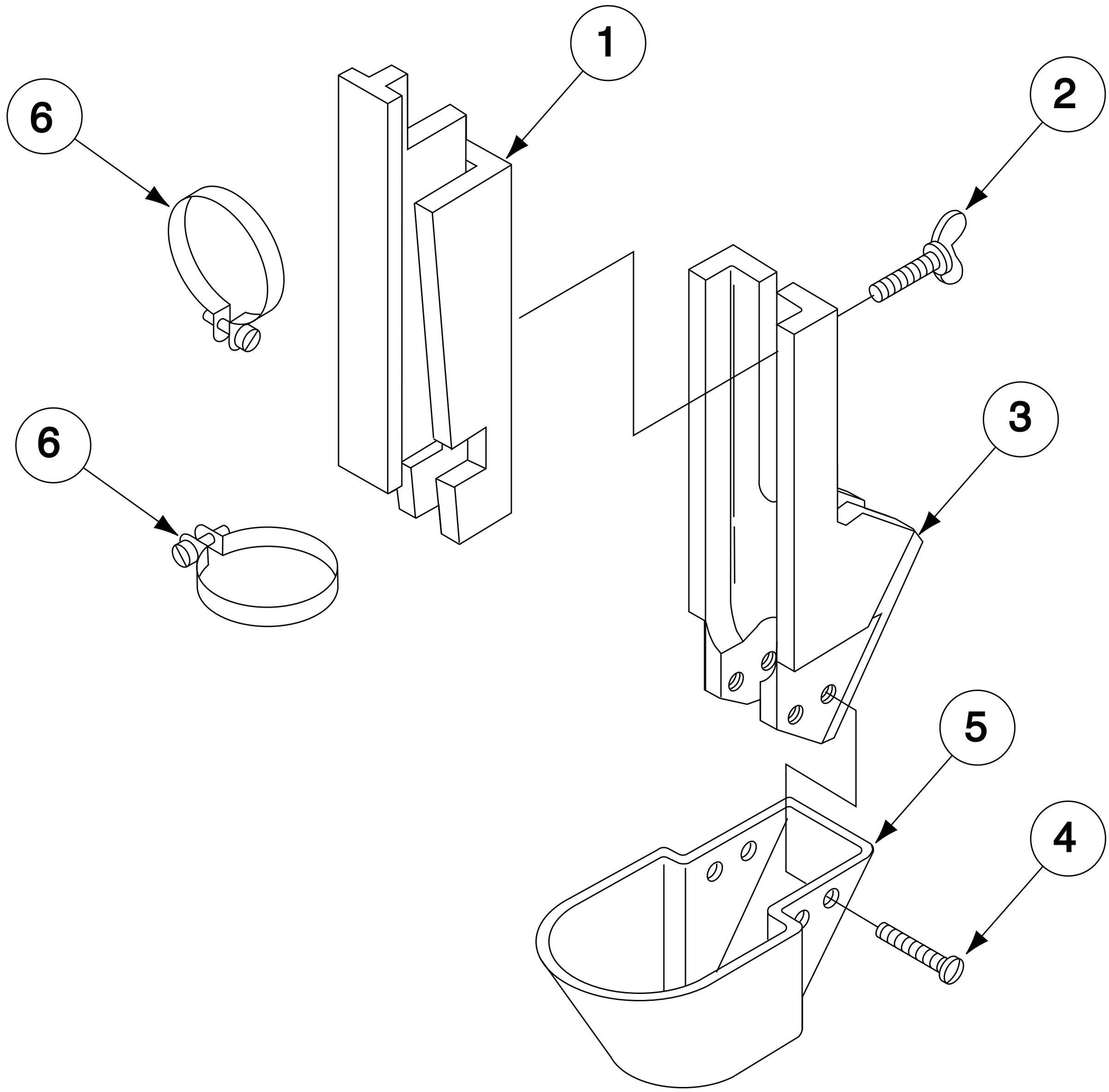
L5297
10-2-81Q

Indicates a Change This Printing

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9	
	Solid State Remote Field Control, Includes:	K224	1										
1	Top Door	M10639-4	1										
2	Terminal Strip	S14530-1	1										
	Number Plate	T10726-90	1										
4	Capacitor	S10593	1										
5	Auto Transformer	M12702 ø	1										
6	Box Assembly	M12706 ø	1										
7	Transformer	S15257 ø	1										#
8	Capacitor	T11079	1										
9	Nameplate	M12688	1										
10	Polarity Switch	S13417 ø	1										
11	Fuse Holder	S10433	1										
	Fuse	T10728-8	1										
12	Capacitor	S13490-1	1										
13	Diode	T12705-15	1										
14	SCR and Heat Sink	M13342 ø	1										
15	Control P.C. Board (Code 7359 Only)	L5316	1										
15	Control P.C. Board (Code 7683 & Above)	L5759-1	1										
16	Caution Decal	T13470	1										
18	Choke	S14644	1										
19	Resistor (Code 7742 & Above)	T12731-42F	1										
	K224 Mounting Angles	S12995-1 & S13709	1 ea										

Ø This part is obsolete and no longer available.

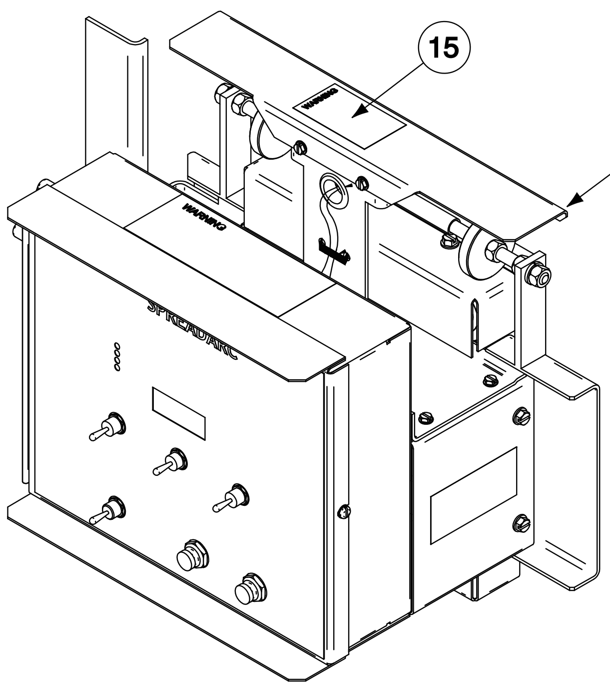
K285 CONCENTRIC FLUX CONE

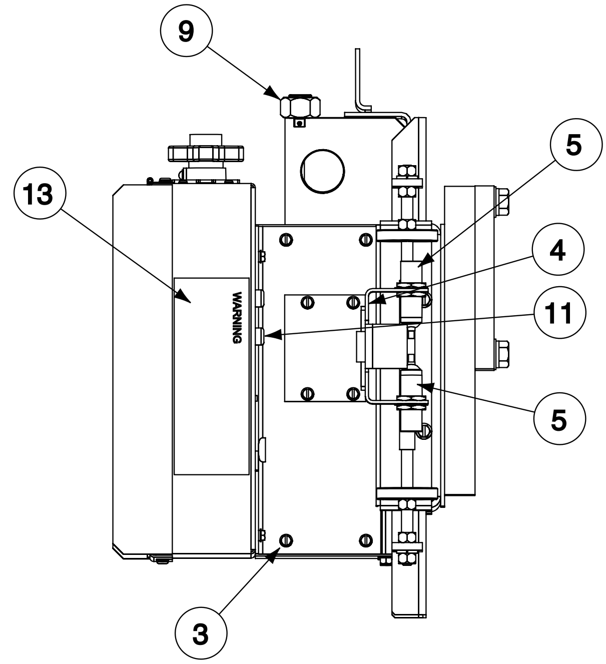


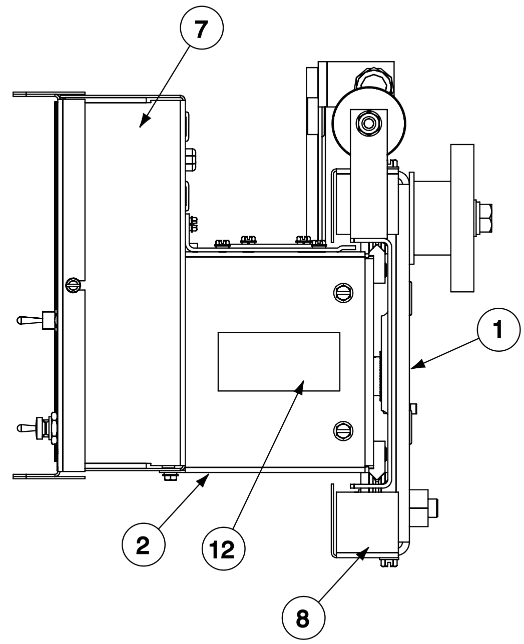
Indicates a Change This Printing

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9
	Concentric Flux cone, Includes:	K285	1	X								
1	Side Plate	T14177	1	X								
2	Thumb Screw	T9078-1	1	X								
3	Support Arm	M13455	1	X								
4	Sems Screw	T10082-4	4	X								
5	Flux Cone	M13454	1	X								
6	Hose Clamp	S10888-31	2	X								
	Items Not Illustrated											
	Flux Hose	T10642-10	1	X								
	Flux Hose Tube	T6996-9	1	X								

K278-1 SPREADARC – COMPLETE ASSEMBLY





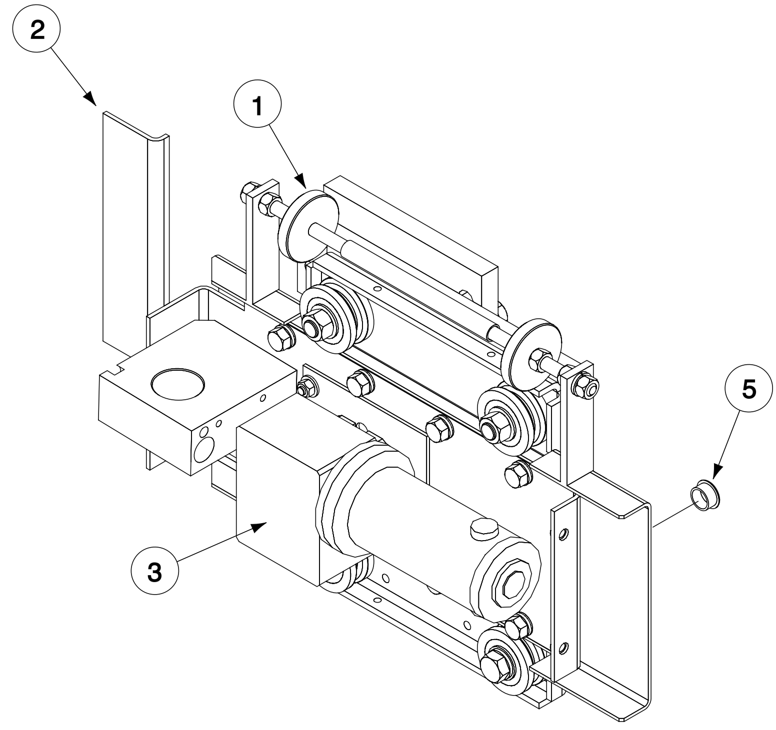


Indicates a Change This Printing

Use only the parts marked "X" in the column under the heading number called for in the model index page.

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9	
1	Carriage & Track Assembly	See P-114-L.2	1										
2	Bottom Shield	M13277-1	1										
	Thread Forming Screw	S9225-70	4										
3	Top Shield	M20176	1										
	#10-24 x .50 HHCS	CF000371	4										
	Lock Washer	T9695-1	4										
4	Proximity Sensor Bracket	M20331	1										
	Grommet	T12380-4	1										
	#10-24 X .50 HHCS	CF000371	4										
	Lock Washer	T9695-1	4										
5	Proximity Sensor Assembly	M21347	2										#
7	Control Box Assembly	See P-114-P	1										
8	Carriage Guard	M13284	2										
	Thread Forming Screw	S9225-70	4										
9	Draw Bolt	T4893-3	1										
	3/4-10 HN	CF000025	1										
	Support Pin Assembly	T14042	1										
11	Grommet	T9274-1	2										
12	Decal	T13470	1										
13	Decal	S19338	2										
14	Guard	M21264	1										
	#10-24 x .50 HHCS	CF000371	2										
	Lock Washer	T9695-1	2										
15	Decal	T13086-62	1										

SPREADARC CARRIAGE, TRACK & DRIVE MOTOR ASBLY (K278-1)



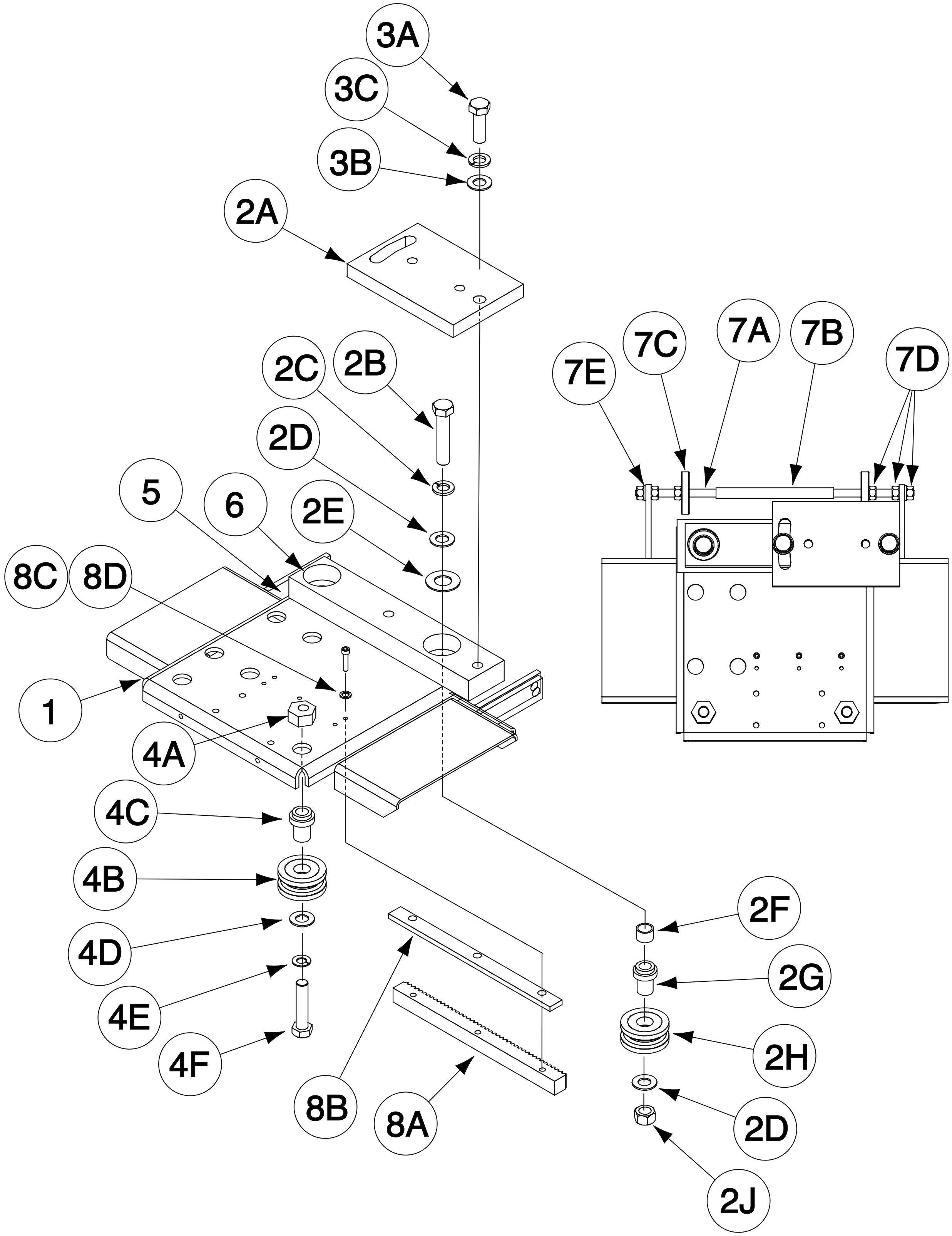
Indicates a Change This Printing

Use only the parts marked "X" in the column under the heading number called for in the model index page.

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9
	Carriage & Track Asbly (L12002), Includes:	**NSS**										
1	Carriage Assembly	See P-114-M.2	1									
2	Track Assembly (M20165), Includes:	**NSS**	1									
	Track Support Welded Assembly	M20166	1									
	Track	S15882	2									
	3/8-16 x .625 HHCS	CF000018	8									
	Lock Washer	E106A-16	8									
	Plain Washer	S9262-76	8									
3	Drive Motor Assembly	L12135	1									
4A	Plain Washer (Not Shown)	S9262-98	3									
4B	Hex Lock Nut (Not Shown)	T9187-6	3									
5	Plug Button	T10397-2	4									

NOTES

SPREADARC CARRIAGE ASSEMBLY (K278-1)



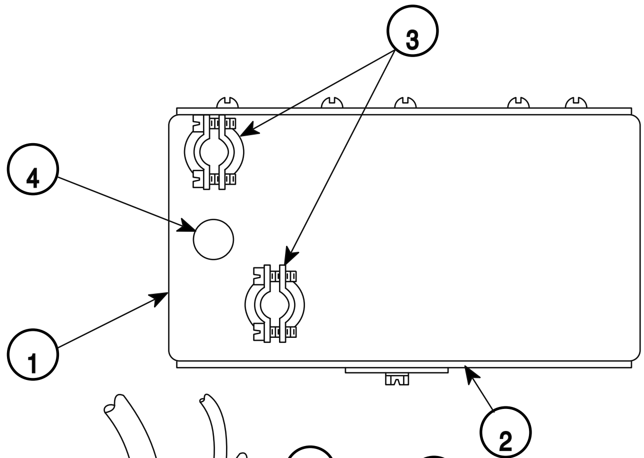
P-114-M.2

Indicates a Change This Printing

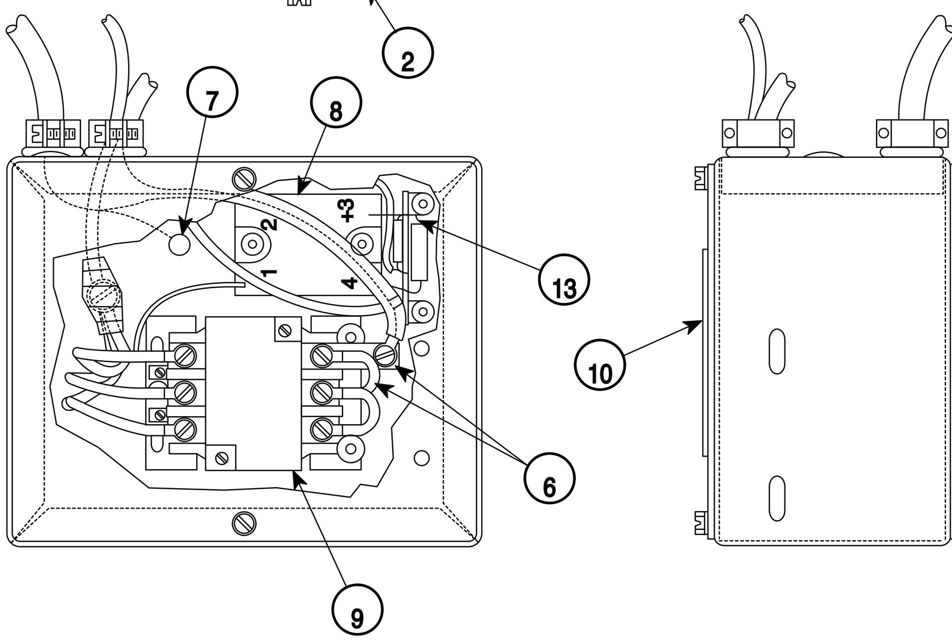
ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9
	Carriage Assembly (L12007), Includes	**NSS**										
1	Carriage	M20174	1									
2A	Head Mounting Plate	S15872	1									
2B	1/2-13 x 2.50 HHCS	CF000110	2									
2C	Lock Washer	E106A-15	2									
2D	Plain Washer	S9262-1	4									
2E	Insulating Washer	S10773-9	2									
2F	Insulating Tube	T7305-38	2									
2G	Bearing Bushing	T14038-2	2									
2H	“V” Roller	S15884	2									
2J	1/2-13 HN	CF000027	2									
3A	1/2-13 x 1.50 HHCS	CF000052	2									
3B	Plain Washer	S9262-1	2									
3C	Lock Washer	E106A-15	2									
4A	Eccentric Adjuster	T14039	2									
4B	“V” Roller	S15884	2									
4C	Bearing Bushing	T14038-1	2									
4D	Plain Washer	S9262-1	2									
4E	Lock Washer	E106A-15	2									
4F	1/2-13 x 2.25 HHCS	CF000064	2									
5	Head Insulation	S15869	1									
6	Head Support	S15870	1									
7A	Stud	T12581-7	1									
7B	Insulating Tube	T7028-258	1									
7C	Cam	S15871	2									
7D	3/8-16 HN	CF000067	6									
7E	Lock Washer	E106A-16	2									
8A	Drive Shaft Rack	S14747	1									
8B	Spacer	T14036	1									
8C	Socket Head Cap Screw	T9447-22	3									
8D	Lock Washer	T4291-A	3									

NSS - Not Sold Separately

K237 LINC-FILL STARTING RELAY ASSEMBLY



NOTE: This parts list covers two versions of the K237 Assembly. One built before Sept. 1988 identified by one box connector and two grommets located in the box tops, and one built after Sept. 1988 with two box connectors in the box top. Use column one for assemblies built before Sept. 1988. Use column two for assemblies built after Sept. 1988.



M15663
7-15-88F

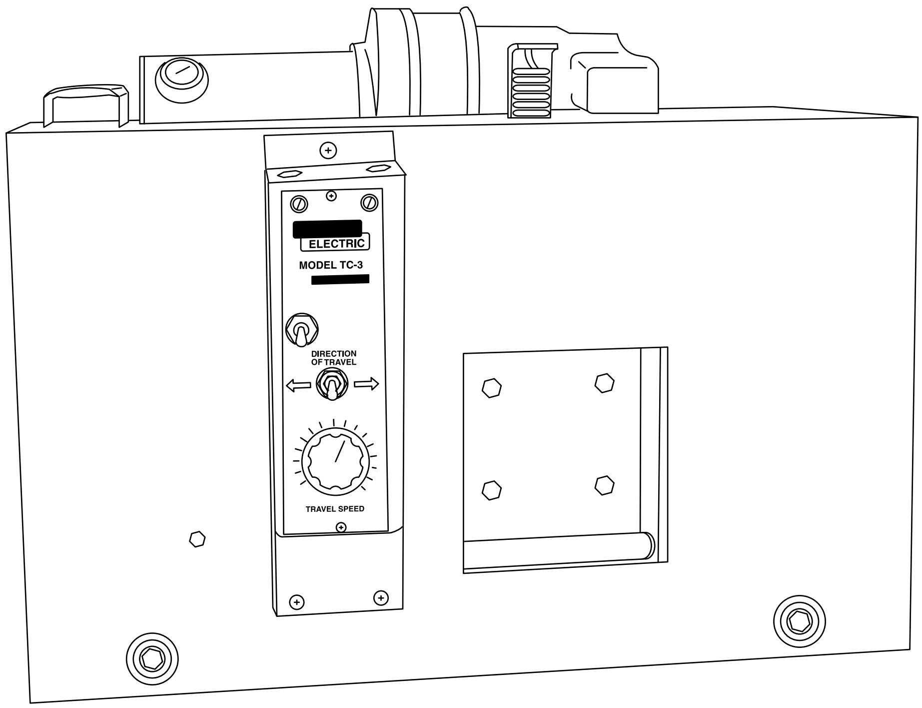
Use only the parts marked "X" in the column under the heading number called for in the model index page.

Indicates a Change This Printing

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9	
1	Box Welded Assembly	S15316	1	X	•								
1	Box Welded Assembly	S15316-1 ø	1	•	X								#
2	Box Cover	S15347	1	X	X								
	Self Tapping Screw	S8025-12	2	X	X								
3	Box Connector	T9639-2	1 or 2	X	X								
4	Grommet	S10255-14	2	X	•								
5	Jumper	S14301	1	X	•								
6	Jumper	T12339	1	X	•								
7	Thread Forming Screw	S9225-30	1	X	X								
	Hex Nut	#10-24	2	X	X								
8	Solid State Relay	S15317-1	1	X	X								
9	AC Contactor	Order Kit S18796	1	X	•								
9	AC Contactor	M12161-17	1	•	X								
10	Warning Decal	T13470	1	X	X								
13 or 14	Terminal Strip Assembly, Includes:	T13885	1	X	X								
	Capacitor	T11577-30	1	X	X								
	Resistor	T12731-9	1	X	X								

 P-132-A

TC-3 SELF-PROPELLED TRAVEL CARRIAGE

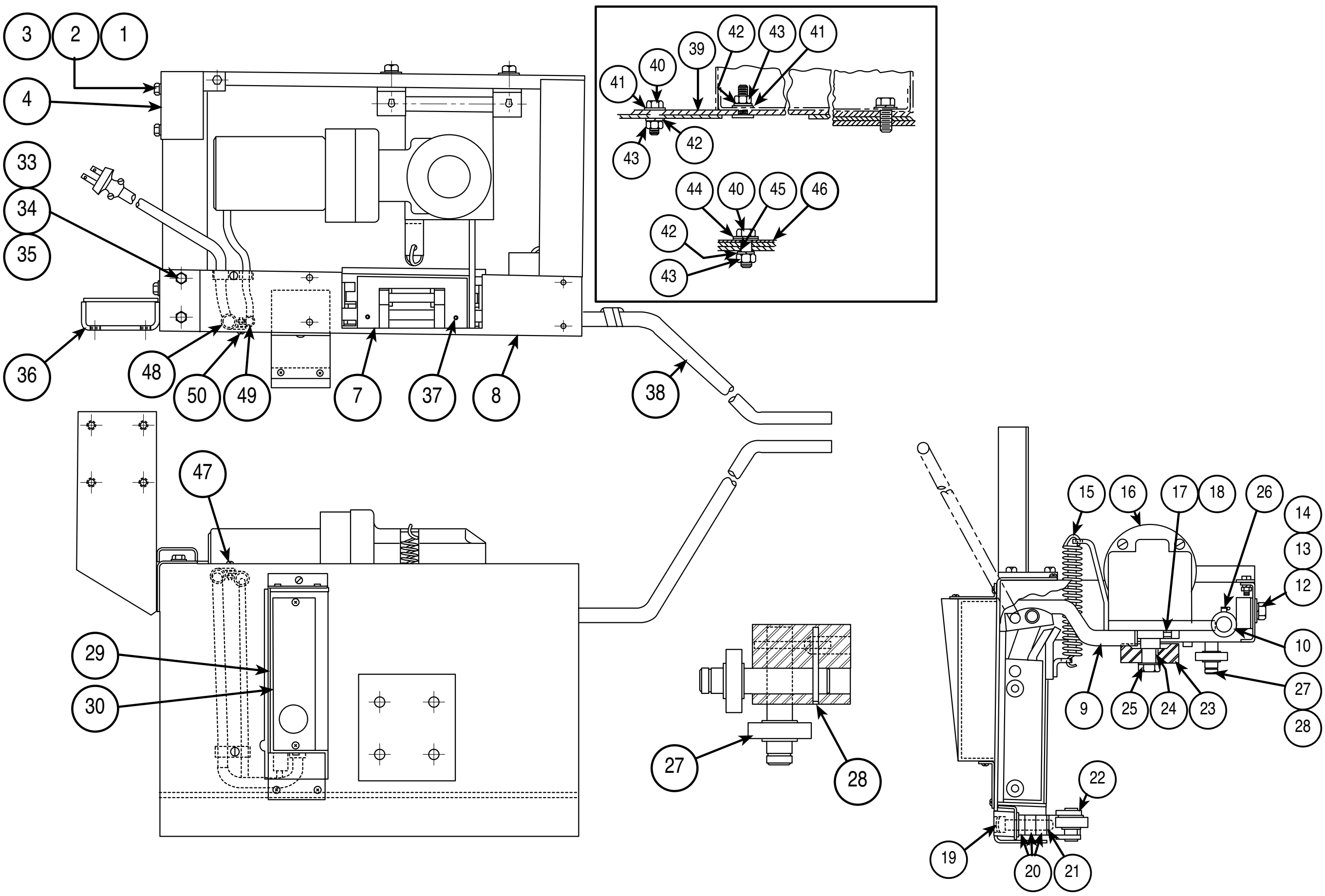


Parts Lists Index

This parts list covers machines thru Code 9021. For Codes above 9021 contact Service Dept.

For K325-S, K325-F, (Use Column One on P-132-C, -D, & -F) #
For K325-HC, K325-HC-F, (Use Column Two on P-132-C, -D, & -F) #

TC-3 GENERAL ASSEMBLY



G1326
9-15-78A

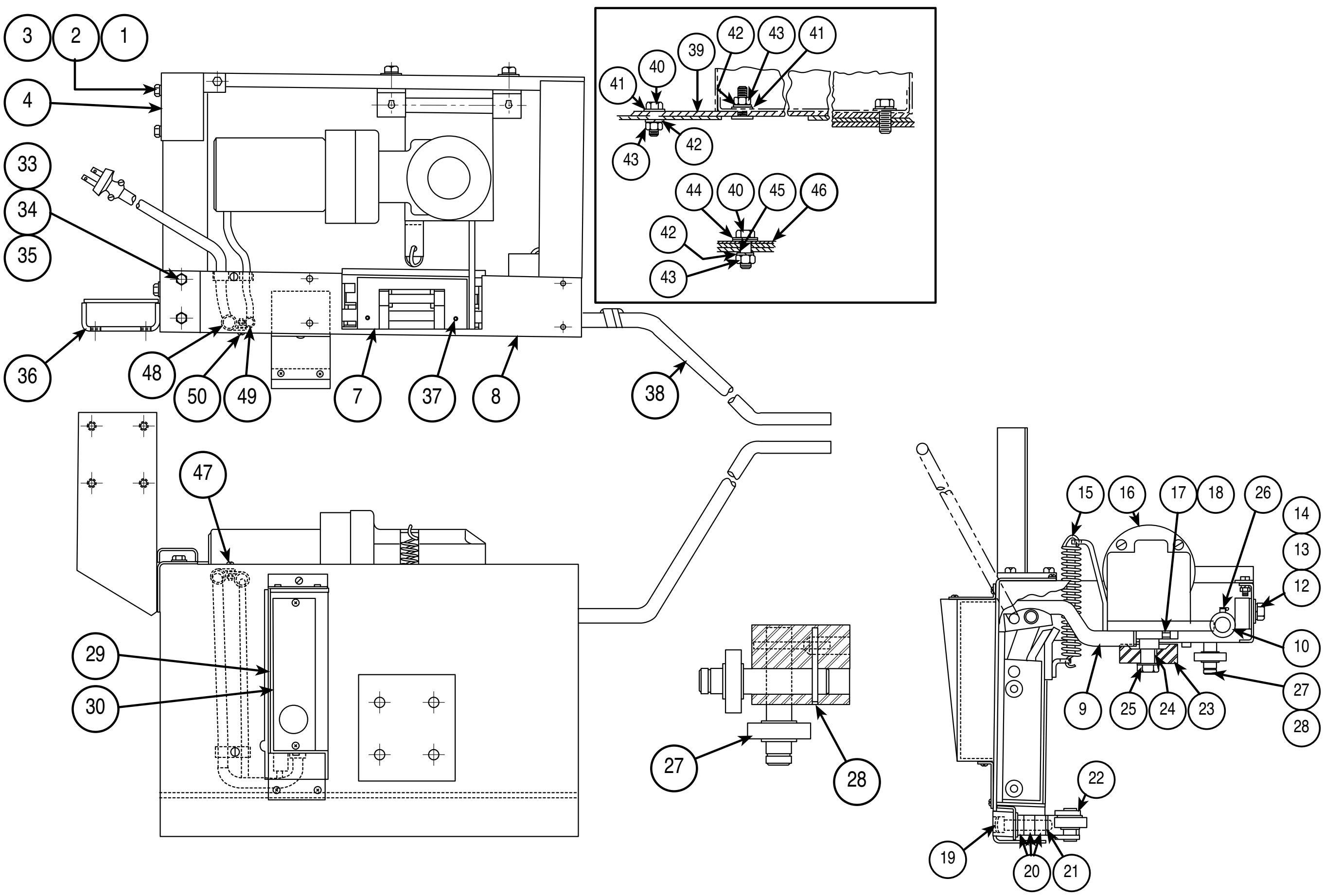
 P-132-C.1

Use only the parts marked “X” in the column under the heading number called for in the model index page.

Indicates a Change This Printing

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9
	Carriage Assembly (K325-S 5-75 in/min) Includes: (Below Code 8400)	G1326-1	1	X	•							
	Carriage Assembly (K325-S 5-75 in/min) Includes: (Code 8400 to 9000)	G1565-1	1	X	•							
	Carriage Assembly (K325-S 5-75 in/min) Includes: (Above Code 9000)	G1565-3	1	X	•							
	Carriage Assembly (K325-F 15-270 in/min) Includes: (Below Code 8400)	G1326-2	1	X	•							
	Carriage Assembly (K325-F 15-270 in/min) Includes: (Code 8400 to 9000)	G1565-2	1	X	•							
	Carriage Assembly (K325-F 15-270 in/min) Includes: (Above Code 9000)	G1565-4	1	X	•							
	Carriage Assembly (K325-HC-S 5-75 in/min) Includes: (Below Code 8400)	G1434-1	1	•	X							
	Carriage Assembly (K325-HC-S 5-75 in/min) Includes: (Code 8400 to 9000)	G1564-1	1	•	X							
	Carriage Assembly (K325-HC-S 5-75 in/min) Includes: (Above Code 9000)	G1564-3	1	•	X							
	Carriage Assembly (K325-HC-F 15-270 in/min) Includes: (Below Code 8400)	G1434-2	1	•	X							
	Carriage Assembly (K325-HC-F 15-270 in/min) Includes: (Code 8400 to 9000)	G1564-2	1	•	X							
	Carriage Assembly (K325-HC-F 15-270 in/min) Includes: (Above Code 9000)	G1564-4	1	•	X							
1	Hex Head Screw	1/4-20x.75	3	X	X							
2	Lockwasher	E106A-2	3	X	X							
3	Hex Nut	1/4-20	1	X	X							
4	Cable Clamp	M8501	1	X	X							
7	Head Mounting and Lift Mechanism	See P-101-Q	1	X	X							
	Lift Hand Stud	T13872	1	X	X							
	Roller	T8128	1	X	X							
	Roll Pin	T9967-30	1	X	X							
8	Carriage Frame Assembly	G1322	1	X	X							
9	Gear Box Mounting Plate	M12550	1	X	X							
10	Swivel Motor Mount	S15772	2	X	X							
11	Shim (.0179 Thick) (Not Shown)	T10778-1	As Reqd.	X	X							
11	Shim (.0598 Thick) (Not Shown)	T10778-2	4	X	X							
11	Shim (.1875 Thick) (Not Shown)	S10040-66	2	•	X							
12	Hex Head Bolt	1/2-13x1.00	2	X	•							
12	Hex Head Bolt	1/2-13x1.25	2	•	X							
13	Lockwasher	E106A-5	2	X	X							
14	Plain Washer	S9262-1	2	X	X							
15	Spring	T5338	1	X	X							
16	Motor and Gear Box Assembly	See P-132-D	1	X	X							
17	Socket Head Cap Screw	T9447-11	3	X	X							
18	Lockwasher	E106A-2	3	X	X							
19	Socket Head Cap Screw	T9447-49	2	X	X							
20	Spacer (.362 Thick)	S10262-4	2	X	•							
20	Spacer (.562 Thick)	S10262-5	4	X	X							
21	Shim (.010 Thick)	S9262-50	As Reqd.	X	X							
21	Shim (.002 Thick)	S9262-73	As Reqd.	X	X							

TC-3 GENERAL ASSEMBLY



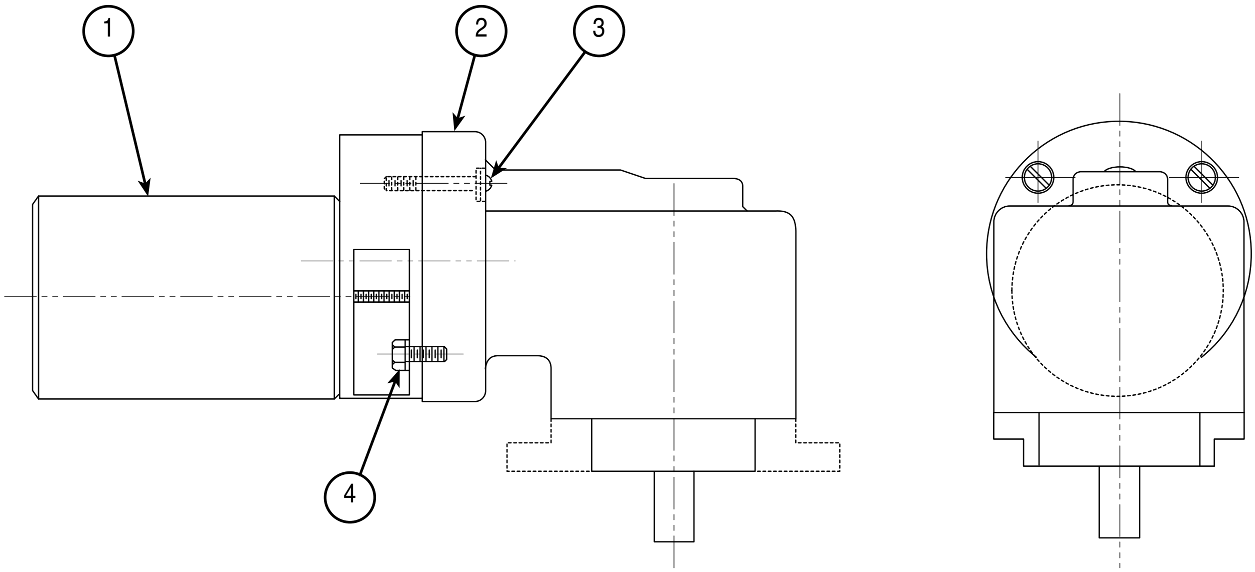
G1326
2-29-80B

Indicates a Change This Printing

Use only the parts marked “X” in the column under the heading number called for in the model index page.

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9
22	Lower Bearing Bar Assembly, Includes:	M12980-1	1	•	X							
22	Lower Bearing Bar Assembly, Includes:	M12980-2	1	X	•							
	Bearing	M9300-67	2	•	X							
	Bearing	M9300-6	2	X	•							
23	Drive Wheel (Rack Tooth-Std. Below Code 9000- Option Above 9000)	T13586	1	X	X							
23	Drive Wheel (Helical Tooth-Std. Above Code 9000)	T13586-1	1	X	X							
24	Key	M8776-31	1	X	X							
25	Lockwasher	T9860-2	1	X	X							
	Hex Nut	T10552	1	X	X							
26	Oil Cup	T8679	2	X	X							
27	Bearing Assembly, Includes:	T13875	4	•	X							
27	Bearing Assembly, Includes:	T13876	4	X	•							
	Bearing	S18576	1	•	X							
	Bearing	M9300-6	1	X	•							
28	Roll Pin	T9967-43	4	X	X							
29	Travel Control Box Assembly	See P-132-F	1	X	X							
	Mounting Angle	S16138	2	X	X							
30	Nameplate (5-75 in/min)	M13469-3	1	X	X							
30	Nameplate (15-270 in/min)	M13469-4	1	X	X							
33	Hex Head Screw	3/8-16x.875	3	X	X							
34	Lockwasher	E106A-4	3	X	X							
35	Hex Jam Nut	3/8-16	1	X	X							
36	Wire Reel Support	L3154	1	X	X							
37	Roll Pin	T9967-30	1	X	X							
38	Lift Handle	M12968	1	X	X							
39	Mounting Plate	S15082	1	X	X							
40	Hex Head Screw	1/4-20x.75	4	X	X							
41	Plain Washer	S9262-98	6	X	X							
42	Lockwasher	E106A-2	6	X	X							
43	Hex Nut	1/4-20	4	X	X							
44	Insulation Washer	S10773-12	4	X	X							
45	Insulation Tube	T7305-19	4	X	X							
46	Insulation Plate	S10300	1	X	X							
47	Lead Clamp	T12563-7	2	X	X							
48	Lead Clamp	T12563-7	1	X	X							
49	Lead Clamp	T12563-6	1	X	X							
50	Round Head Screw	#10-24x.750	1	X	X							

MOTOR AND GEAR BOX ASSEMBLY



L5197
9-11-86

Indicates a Change This Printing

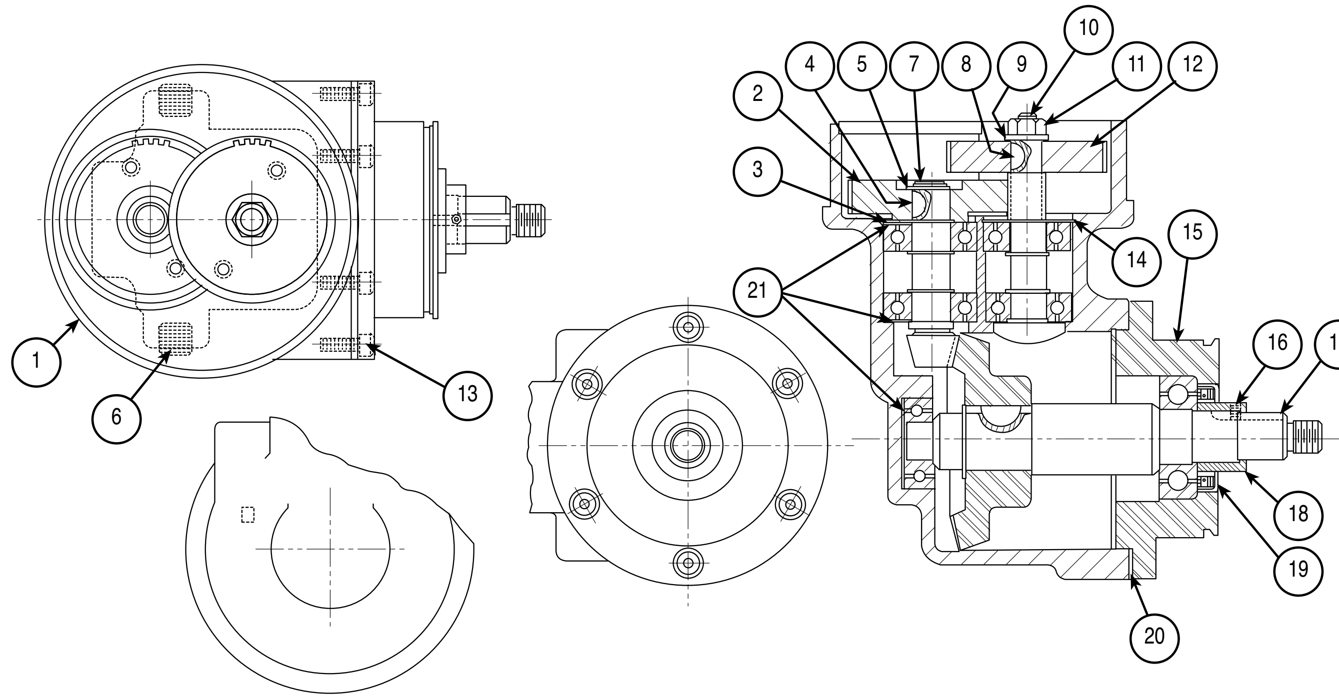
Use only the parts marked "X" in the column under the heading number called for in the model index page.

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9
1	Motor & Adapter Assembly (K325S & K325HC-S)											
	Includes:	L5195-4	1	X	•							
1	Motor & Adapter Assembly (K325F & K325HC-F)											
	Includes:	L5195-1	1	•	X							
	Motor Assembly, Includes:	L5198-3	1	X	•							
	Motor Assembly, Includes:	L5198-2	1	•	X							
	Motor, Includes:	NSS	1	X	X							
	Brush & Spring Assembly (Universal Motor)	M12254-1F	2	X	X							
	Brush & Spring Assembly (Stature Motor)	M13312-12	2	X	X							
	Brush Cap (Universal Motor) Early Design											
	7/8-27 THD	M9655-7A ø	2	X	X							
	Brush Cap (Universal Motor) Present											
	Design 3/4-27 THD	M9655-7B ø	2	X	X							
	Brush Cap (Stature Motor)	M13312-13	2	X	X							
	Pinion Gear	S15013-3	1	X	•							
	Pinion Gear	S15013-2	1	•	X							
	Motor Lead Plug	T10662	1	X	X							
	Adapter Assembly, Includes:											
	Gear Box Adapter	G1324	1	X	X							
	Helical Gear	S15008-1 ø	1	X	•							
	Helical Gear	S15008	1	•	X							
2	Gear Box Assembly	See P-132-E	1	X	X							
3	Round Head Screw	1/4-20 x 1.75	2	X	X							
	Lock Washer	E106A-2	2	X	X							
4	Hex Head Screw	1/4-20 x .75	2	X	X							
	Lock Washer	E106A-2	2	X	X							

Ø This part is obsolete and no longer available.

GEAR BOX ASSEMBLY

Gear Ratio is stenciled on the side of the gear case and on top of Item 12.



L5199
7-24-81S

 P-132-E.b

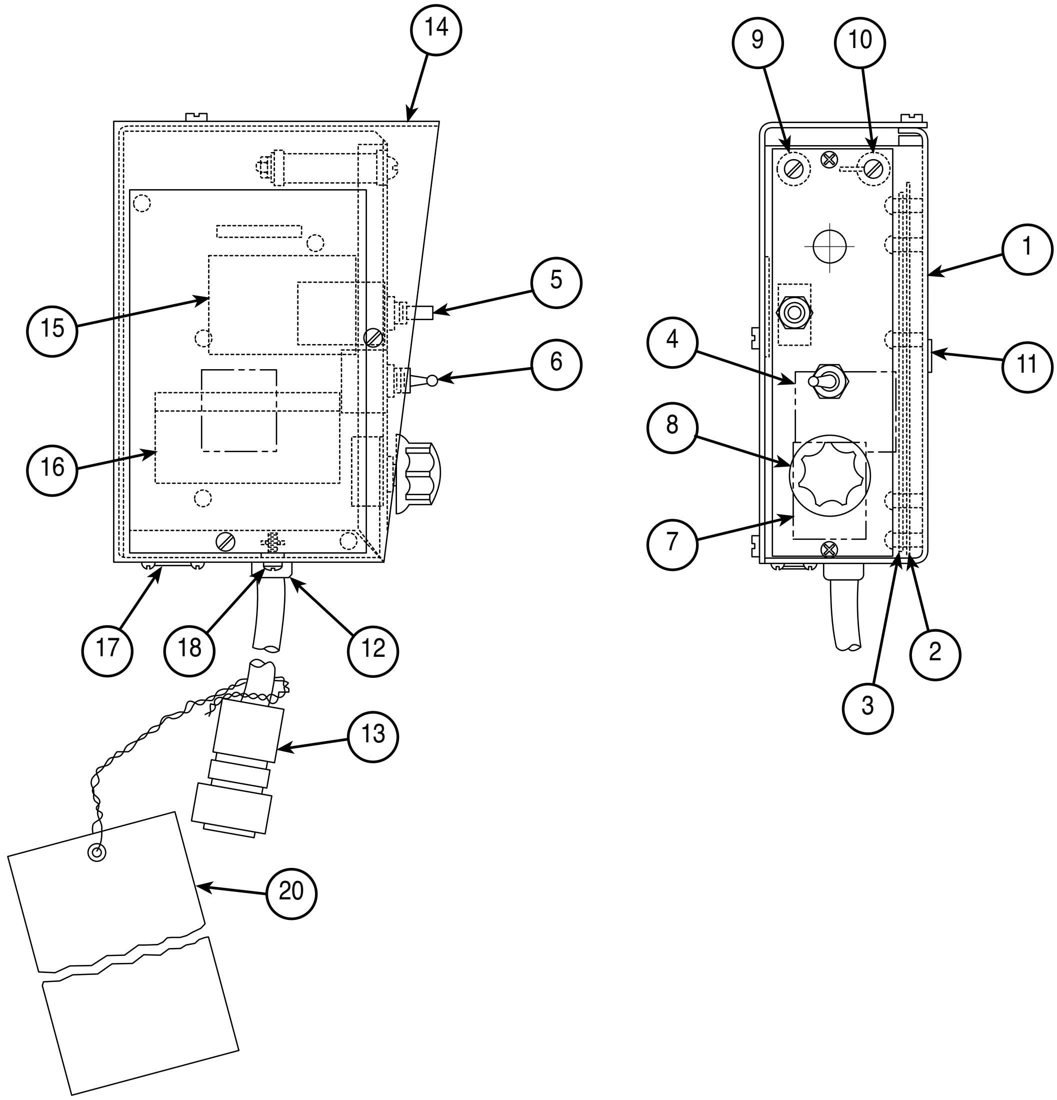
Indicates a Change This Printing

Use only the parts marked "X" in the column under the heading number called for in the model index page.

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9	
	Gear Box Assembly (K325S & K325HC-S) (142/1 Ratio)	L5199-4	1	X									
	Gear Box Assembly (K325F & K325HC-F) (57/1 Ratio)	L5199-5	1	X									
	Gear Box Assembly (K579-1, K580 & K581) (21/1 Ratio)	L5199-7 ø	1	X									#
1	Gear Box	G1328	1	X									
2	Gear	S12504	1	X									
3	Snap Ring	S9776-23	1	X									
4	Woodruff Key	#304	1	X									
5	Snap Ring	S9776-16	1	X									
6	Set Screw	S11604-26	2	X									
7	Bevel Shaft Assembly	S12511	1	X									
8	Woodruff Key	#304	1	X									
9	Flat Washer	S9262-121	1	X									
10	Spur Shaft Assembly	S12510	1	X									
11	Hex Nut	5/16-18	1	X									
12	Helical Gear (142/1 Ratio)	S12882	1	X									
12	Helical Gear (57/1 Ratio)	S12881	1	X									
12	Helical Gear (21/1 Ratio) (High Speed)	S20218	1	X									
13	Socket Head Screw	T9447-28	3	X									
13	Socket Head Screw (High Speed)	T9447-28	6	X									
14	Snap Ring	S9776-23	1	X									
15	Gear Case Collar	M10256	1	X									
16	Hollow Set Screw	S11604-13	1	X									
17	Output Shaft Assembly	S12509	1	X									
18	Spacer	T12146	1	X									
19	Oil Seal	S7611-15	1	X									
20	Gasket (.0125 Thick)	T12119-1	As Req'd	X									
20	Gasket (.004 Thick)	T12119-2	As Req'd	X									
21	Spacer Washer (.003 Thick)	S9262-110	As Req'd	X									
21	Spacer Washer (.010 Thick)	S9262-111	As Req'd	X									

Ø This part is obsolete and no longer available.

TRAVEL CONTROL BOX ASSEMBLY



M14172
6-25-82M

P-132-F.b

Indicates a Change This Printing

For Carriage Codes 8018, 8019, 8020 & 8021, use parts marked “X” in Column 1.
For Carriage Codes 8424, 8425, 8426 & 8427, use parts marked “X” in Column 2.

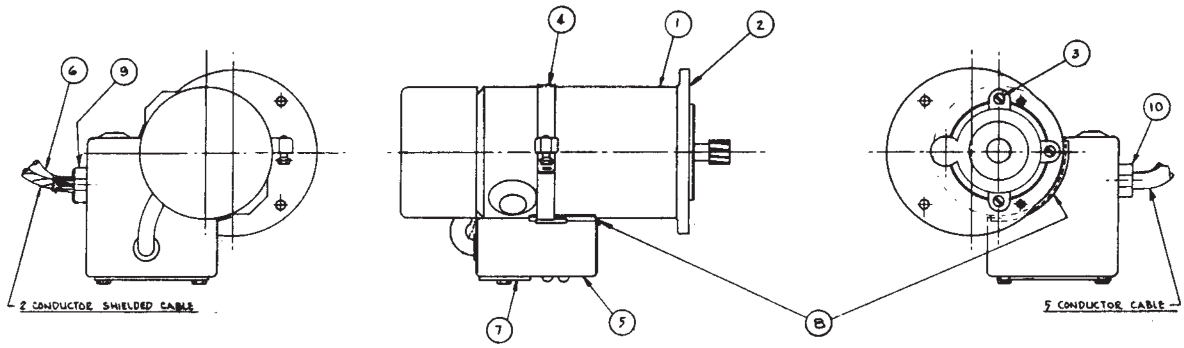
ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9	
1	Travel Control Box	S16128	1	X	X								
2	Travel P.C. Board Insulation	T14189	1	X	X								
3	Travel P.C. Board	L6944-1	1	X	X								
4	A.C. Relay	S13929-2	1	X	X								#
5	Circuit Breaker	T12287-8	1	X	X								
6	Switch	T10800-7	1	X	X								
7	Insulation	T12792-1	1	X	X								
8	Potentiometer	T10812-71	1	X	X								
	Knob	T10491	1	X	X								
9	Resistor	S10404-73	1	X	X								
	Round Head Screw	#10-24 x 2.75	1	X	X								
	Insulating Washer	S10773-7	2	X	X								
	Plain Washer	S9262-27	1	X	X								
	Lockwasher	E106A-1	1	X	X								
	Hex Nut	#10-24	1	X	X								
10	Resistor	S10404-78	1	X	X								
	Round Head Screw	#8-32 x 2.50	1	X	X								
	Insulating Washer	S10773-7	2	X	X								
	Plain Washer	S9262-3	1	X	X								
	Lockwasher	T4291-A	1	X	X								
	Hex Nut	#8-32	1	X	X								
11	Plug Button	T10397-3	1	X	X								
12	Grommet	T9274-4	1	X	X								
13	Cable Assembly, Includes:	S15003 ø	1	X	•								#
	Plug	S10272	1	X	•								
13	Cable Assembly, Includes:	S17020	1	•	X								
	Polarized Plug	S12020-3	1	•	X								
	Cable Clamp	S12024-1	1	•	X								
14	Travel Control Box Cover	S15238-1	1	X	X								
15	Insulation	E1400/6-.016-2.00-2.75	1	X	X								
16	Warning Decal	T13470	1	X	X								
17	Socket and Lead Assembly, Includes:	S12037-1	1	X	X								
	Socket	T10567	1	X	X								
18	Thread Cutting Screw	S9225-36	1	•	X								
	Lockwasher	T9695-1	1	•	X								
	Hex Nut	#10-24	2	•	X								
20	Instruction Tag	S17021	1	•	X								

Ø This part is obsolete and no longer available.

07-20-2001

NOTES

WIRE FEED DRIVE MOTOR



M13902
6-3-83E

Indicates a Change This Printing

W/O H.F. – Without High Frequency Insulation
W/H.F. – With High Frequency Insulation

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9	
	Drive Motor & Connection Box Assembly, Includes: (57/1 Ratio W/O H.F.)	M13902-1	1										
	Drive Motor & Connection Box Assembly, Includes: (95/1 Ratio W/O H.F.)	M13902-2	1										
	Drive Motor & Connection Box Assembly, Includes: (142/1 Ratio W/O H.F.)	M13902-3	1										
	Drive Motor & Connection Box Assembly, Includes: (57/1 Ratio W/H.F.)	M13902-4	1										
	Drive Motor & Connection Box Assembly, Includes: (95/1 Ratio W/H.F.)	M13902-5	1										
	Drive Motor & Connection Box Assembly, Includes: (142/1 Ratio W/H.F.)	M13902-6	1										
	Drive Motor & Connection Box Assembly, Includes: (21/1 Ratio W/O H.F.)	M13902-7 ø	1										#

Ø This part is obsolete and no longer available.

W/O H.F. – Without High Frequency Insulation
W/H.F. – With High Frequency Insulation

Indicates a Change This Printing

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9	
1	Drive Motor Assembly, Includes:												
	(57/1 Ratio W/O H.F.)	L6440-1	1										
	Drive Motor Assembly, Includes:												
	(95/1 Ratio W/O H.F.)	L6440-2	1										
	Drive Motor Assembly, Includes:												
	(142/1 Ratio W/O H.F)	L6440-3	1										
	Drive Motor Assembly, Includes:												
	(57/1 Ratio W/H.F.)	L6440-4	1										
	Drive Motor Assembly, Includes:												
	(95/1 Ratio W/H.F.)	L6440-5	1										
	Drive Motor Assembly, Includes:												
	(142/1 Ratio W/H.F.)	L6440-6	1										
	Drive Motor Assembly, Includes:												
	(21/1 Ratio W/O H.F.)	L6440-9	1										
	Drive Motor & Pinion, Includes:												
	(57/1 Ratio W/O H.F.)	S16660-1	1										
	Drive Motor & Pinion, Includes:												
	(95/1 Ratio W/O H.F.)	S16660-2	1										
	Drive Motor & Pinion, Includes:												
	(142/1 Ratio W/O H.F.)	S16660-3	1										
	Drive Motor & Pinion, Includes:												
	(21/1 Ratio W/O H.F.) (High Speed)	S16660-5	1										
	Drive Motor & Pinion, Includes:												
	(57/1 W/H.F.)	M14132-1	1										
	Drive Motor & Pinion, Includes:												
	(95/1 Ratio W/H.F.)	M14132-2	1										
	Drive Motor & Pinion, Includes:												
	(142/1 Ratio W/H.F.)	M14132-3	1										
	Drive Motor (W/O H.F.)	S16979-1	1										
	Drive Motor (W/H.F.)	S16985	1										
	Brush & Spring Assembly	M12254-1F	2										
	Brush & Spring Assembly (Stature Motor)	M13312-12	2										
	Brush Cap Early Design 7/8-27 THD	M9655-7A ø	2										#
	Brush Cap Present Design 3/4-27 THD	M9655-7B ø	2										#
	Brush Cap (Stature Motor)	M13312-13	2										
	Pinion (57/1 Ratio)	S15013-1	1										
	Pinion (95/1 Ratio)	S15013-2	1										
	Pinion (142/1 Ratio)	S15013-3	1										
	Pinion (21/1 Ratio)	S15013-6 ø	1										#
	Roll Pinion (For Pinion)	T9967-33	1										
	Shaft Extension (W/H.F. Motor)	S12869	1										
	Coupling (W/H.F. Motor)	S12876-1	1										
	Roll Pin (Coupling To Motor W/H.F.)	T9967-28	1										
	Roll Pin (Coupling To Ext. Shaft W/H.F.)	T9967-1	1										
	Bearing (W/H.F. Motor)	M9300-46	2										
	Snap Ring (Holds Bearings)	S9776-27	3										
	Insulation (W/H.F. Motor)	S11756-A	1										
	Tachometer Pickup Printed Circuit Board	M14701-2	1										
	Tachometer Disc	S16180	1										
	Tachometer Shield Mounting Plate	M13629	1										
	Pickup Housing Assembly	M13578	1										

Ø This part is obsolete and no longer available.

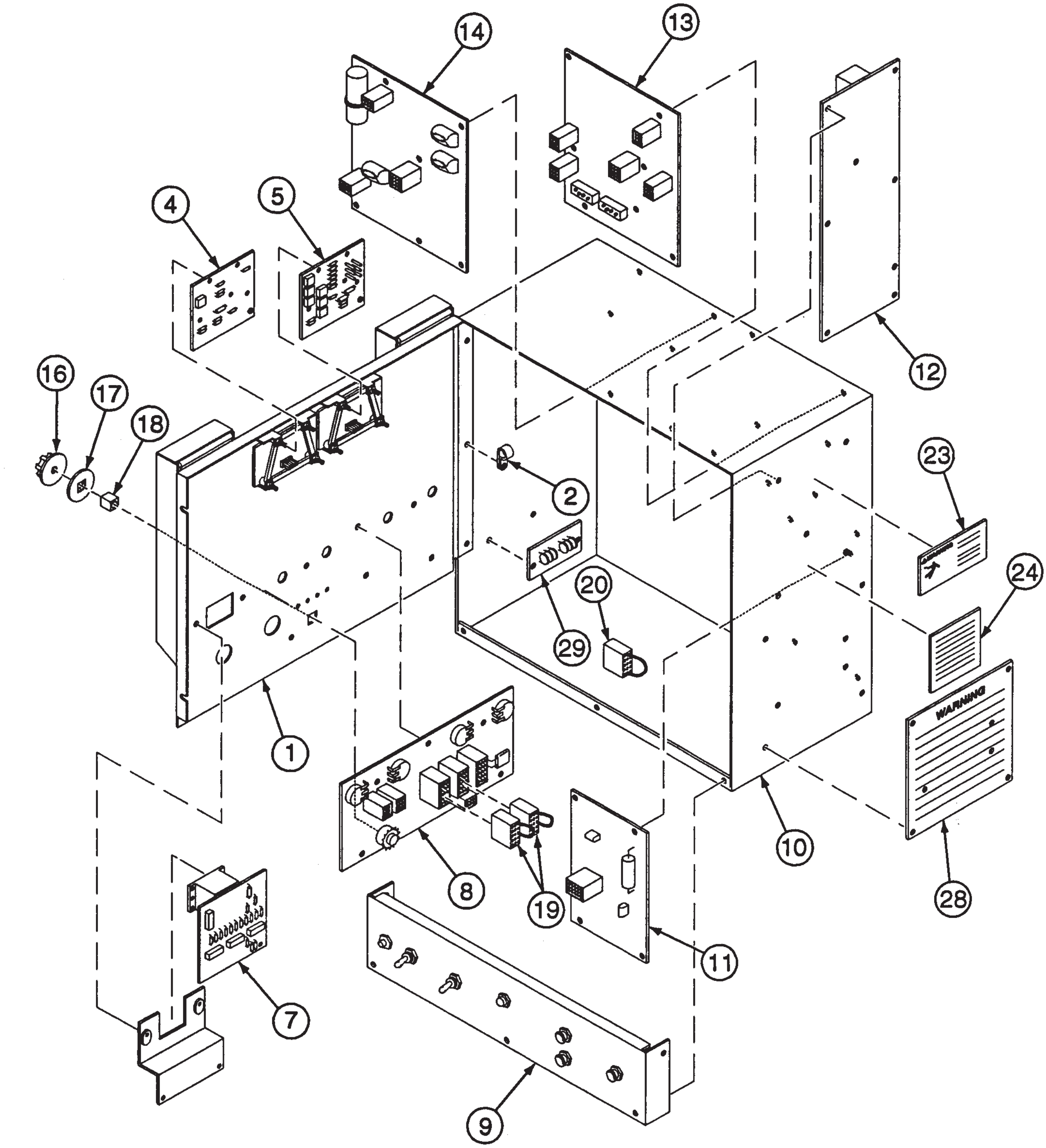
 P-135-C.1.b

Indicates a Change This Printing

W/O H.F. – Without High Frequency Insulation
W/H.F. – With High Frequency Insulation

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9	
1	Cover Assembly	T14326	1										
2	Motor Adapter Plate	M10255-1	1										
3	Flat Head Screw	#8-32 x .75	3										
4	Hose Clamp	S10888-20	1										
5	Connection Box Assembly	M13901	1										
6	Cable Assembly, Includes:	L6209	1										
	Polarized Connector - Tach Cable	S12020-17	1										
	Cable Clamp - Tach Cable	S12024-4	1										
	Polarized Connector - Motor Cable	S12020-27	1										
	Cable Clamp - Motor Cable	S12024-1	1										
7	Box Cover	T13193-1	1										
	Screw	S8025-70	2										
8	Grommet Strip	T12823-18	1										
9	Lead Grommet	T9274-3	1										
10	Lead Grommet	T9274-4	1										
11	Motor End Cover (Not Shown)	S16718	1										#

CONTROL BOX ASSEMBLY

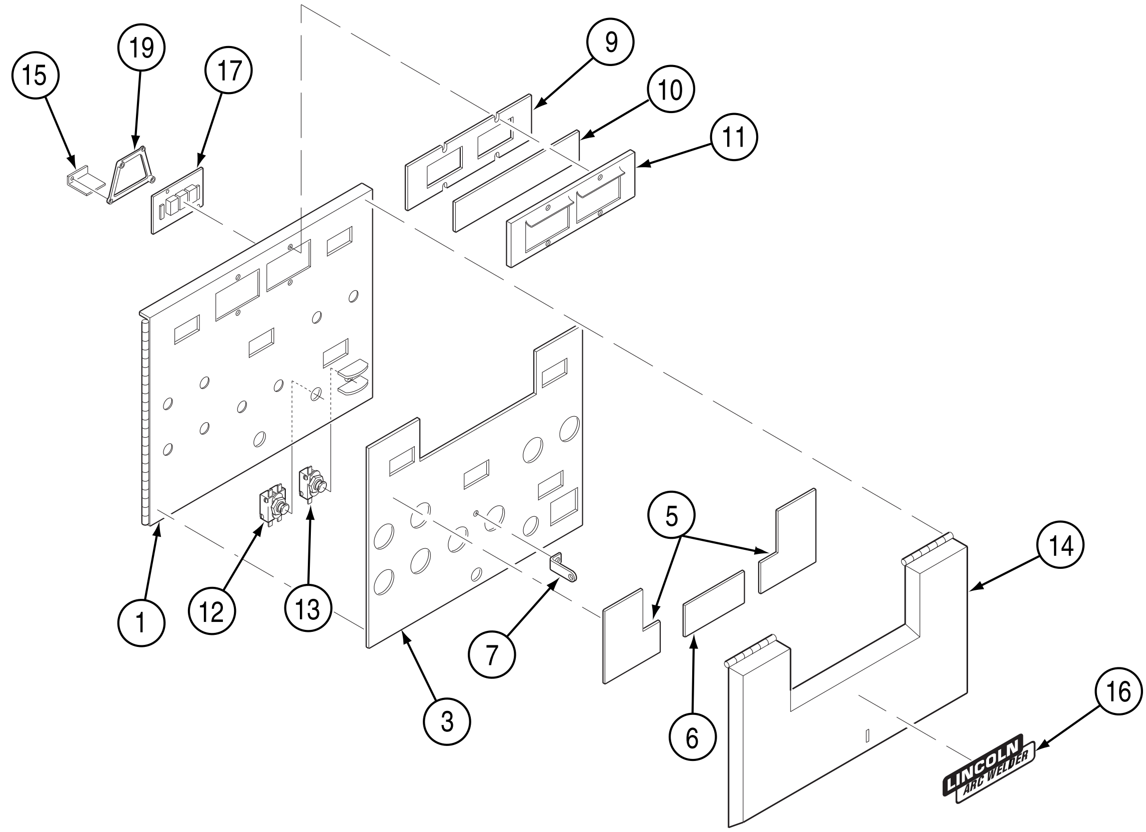


G1555
7-24-81

Indicates a Change This Printing

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9	
1	Door Assembly	See P-135-E	1										
2	Lead Clamp	T12563-8	1										
4	Volts Meter Printed Circuit Board	L6685	1										
5	Speed Meter Printed Circuit Board (Standard)	L6233	1										
5	Speed Meter Printed Circuit Board (High Speed)	L8575-1	1										
7	Burnback Timer Printed Circuit Board	K337-10	1										
8	Procedure Printed Circuit Board (Code 8205 Only)	G1507-1	1										
8	Procedure Printed Circuit Board	G1566-3	1										
	Printed Circuit Board Insulation	S16695	1										
9	Switch Panel Asbly, Includes: (Below Code 11000)	S16713	1										
9	Switch Panel Asbly, Includes: (Above Code 11000)	S16713-1	1										
	Circuit Breaker	T12287-10	1										
	Travel Switch (Below Code 11000)	T13543	1										#
	Travel Switch (Above Code 11000)	T10800-23	1										#
	Control Power Switch (Below Code 11000)	T10800-9	1										
	Control Power Switch (E-Stop) (Above Code 11000)	M20853	1										
	Pilot Light	T13486	1										
	"Inch" Push Buttons	T13541-2	2										
	"Stop" Push Button	T13541-1	1										
	Nameplate (Below Code 11000)	M13935	1										
	Nameplate (Above Code 11000)	M13935-1	1										
10	Control Box	See P-135-F	1										
11	Control Printed Circuit Board (Code 8205 Only)	L6019	1										
11	Control Printed Circuit Board	L6445	1										
	Expansion Nut - Board Mounting	S14020-3	5										
12	Voltage Printed Circuit Board (Code 8205 Only)	L6257	1										
12	Voltage Printed Circuit Board (Below Code 9100 except 8205)	G1556-3	1										
12	Voltage Printed Circuit Board (Above Code 9100)	G1556-5	1										
13	Logic Printed Circuit Board	L6242-2	1										
	Expansion Nut- Board Mounting	S14020-3	7										
14	Power Printed Circuit Board (Code 8205 Only)	L6252	1										
14	Power Printed Circuit Board	L6252-2	1										
	Expansion Nut - Board Mounting	S14020-3	7										
16	Rheostat Knob (Procedure, Start and Crater Boards)	T10491	8										
17	Shaft Seal	T14034	8										
18	Square Insulating Tube	T14767	8										
19	Jumper Plug (Remove when using Start or Crater Board Options)	T13498-10	3										
20	Jumper Plug (Remove when using Multi Procedure Kit) (Code 8300)	T13498-1	1										
23	Caution Decal (Below Code 11000)	T13470	1										
24	Patent Decal (Below Code 11000)	S13232	1										
28	Warning Label (Code 8205 Only)	S16722-2A	1										
28	Warning Label (Below Code 11000)	S16722-2B	1										
28	Warning Label (Above Code 11000)	S16722-33	1										
29	R.F. Bypass Printed Circuit Board (Not used on Code 8205)	M14133-1	1										
	Items Not Illustrated:												
	"Motor" Amphenol Connector	S12021-32	1										
	"Flux" Amphenol Connector	S12021-17	1										
	"Tech" Amphenol Connector	S12021-18	1										
	"Input" Amphenol Connector	S12021-12	1										
	"Travel" Receptacle (Code 8205 Only)	S12101-2	1										
	"Travel" Amphenol Connector	S12021-11	1										
	Rotary Switch Knob (Procedure Board)	T13639	1										
	Optional Printed Circuit Board - Not Illustrated:												
	Start of Crater Module Option, Includes:	K334	1 or 2										
	Timer Printed Circuit Board	K337-10	1 or 2										
	Option Printed Circuit Board	L6246-3	1 or 2										
	Remote Interface Printed Circuit Board	K336	1										
	Weld Timer Printed Circuit Board (10 Second)	K337-10	1										
	Weld Timer Printed Circuit Board (100 Second)	K337-100	1										

CONTROL BOX DOOR ASSEMBLY

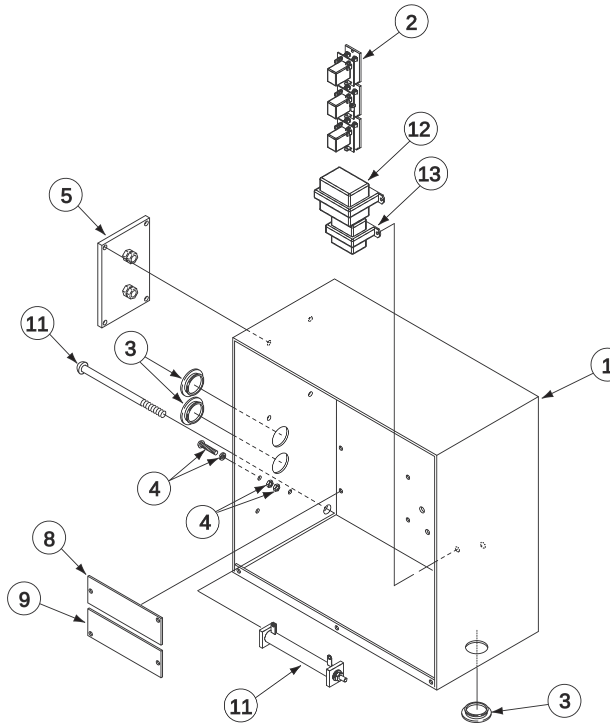


Indicates a Change This Printing

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9	
1	Control Box Door (Below Code 11000)	S16706	1										
1	Control Box Door (Above Code 11000)	S16706-1	1										
3	Nameplate (Below Code 11000)	L6243	1										
3	Nameplate (Above Code 11000)	L6243-1	1										
5	Nameplate Cover	S16696	2										
6	Nameplate Cover	S10509-108	1										
7	Lock Tab	T10045-40	1										
8	Meter & Locating Pin Asbly (Below Code 8990) (Not Shown)	Order S17748	2										
9	Gasket (Below Code 8990)	E1852-.125-.500-2.50	3										
9	Bezel Assembly (Above Code 8990)	S17720	1										
10	Meter Shield (Standard Clear Welding Lens) (Below Code 8990)	T14771	2										
10	Filter Lens (Above Code 8990)	T14807-2	1										
11	Meter Shield Frame	M13934	1										
12	Actuator & Switch Assembly	T14751-1	1										
13	Start Switch	T13541 -2	1										
14	Security Panel Assembly	M13936	1										
15	Insulation	T14468	2										
16	Decal	S11893-2	1										
16	Nameplate (Above Code 11000)	L12800	1										
17	Digital Meter P.C. Board (Above Code 8990 Only)	M14490-[ ]	2										#
19	P.C. Board Spacer (Above Code 8990 Only)	M14537	2										
	High Speed Decal (21 to 1) (Not Shown)	S20166	1										

06-09-2008

CONTROL BOX



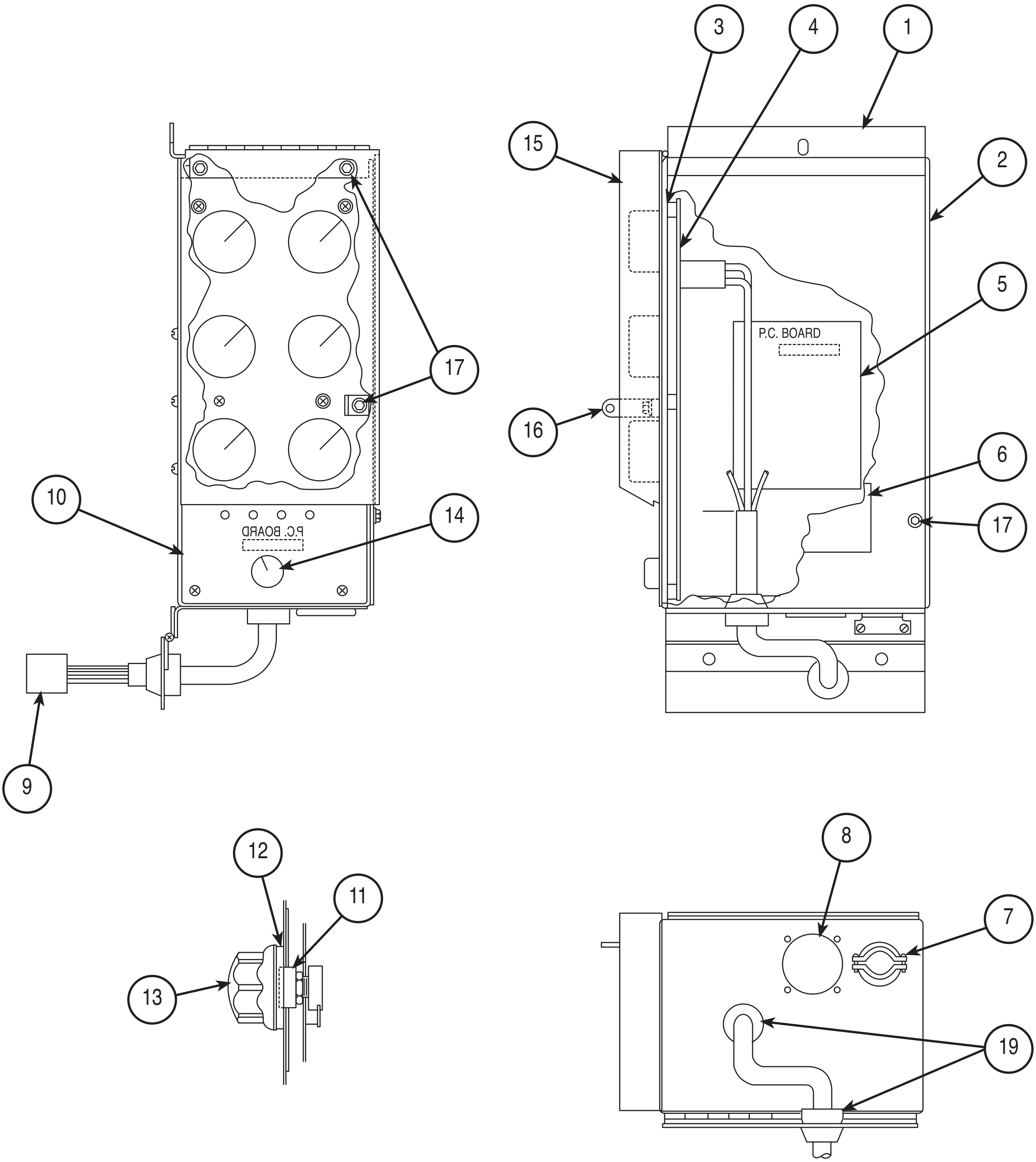
Indicates a Change This Printing

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9	
1	Control Box Welded Assembly (Code 8205 Only)	S16707	1										
	Control Box Welded Assembly (All Other Codes)	S16991-1	1										
2	Relay	S22182	3										
3	Plug Button	T13597-1	3										
4	Thread Cutting Screw	S9225-36	1										
	Lock Washer	T9695-1	1										
	#10-24 HN	CF000010	2										
5	Reed Switch and Mounting Plate Assembly,												
	Includes: (Below Code 9100 & Above 9338)	S16705	1										#
	Reed Switch Assembly (Below Code 9100)	S12334-35	1										
5	Reed Switch and Mounting Plate Assembly												
	Includes: (Above Code 9100) (See Note 1:)	M15269	1										
	Reed Switch Stud Assembly (Above Code 9100)(See Note 1:)	M15268	1										
8	Number Plate	T10726-139	1										
9	Number Plate	T10726-138	1										
11	Resistor	S10404-75	1										
	#10-24x5.00 RHS	CF000045	1										
	Insulating Washer	T4479-A	2										
12	Transformer	S16711	1										
13	Transformer (Code 8205 Only)	S16712	1										
13	Transformer	S17101	1										
14	Cable Tie Mount (Not Shown)	T13941	2										
15	Harness, Includes: (Below Code 11000) (Not Shown)	G1554	1										
	Harness, Includes: (Above Code 11000) (Not Shown)	G1554-1	1										
	Terminal Strip	S14530-5	2										
	Jumper for Terminal Strip	T13962	1										
	Fuse (1/2 Amp, 125 Volt)	T10728-14	1										
	Tach Connector	S13100-71	1										

05-22-2008

NOTE 1 : These Parts are only used in NA-5 systems that include a PP-500 welder. For all other Power Sources order S16705.

K349 MULTI-PROCEDURE KIT

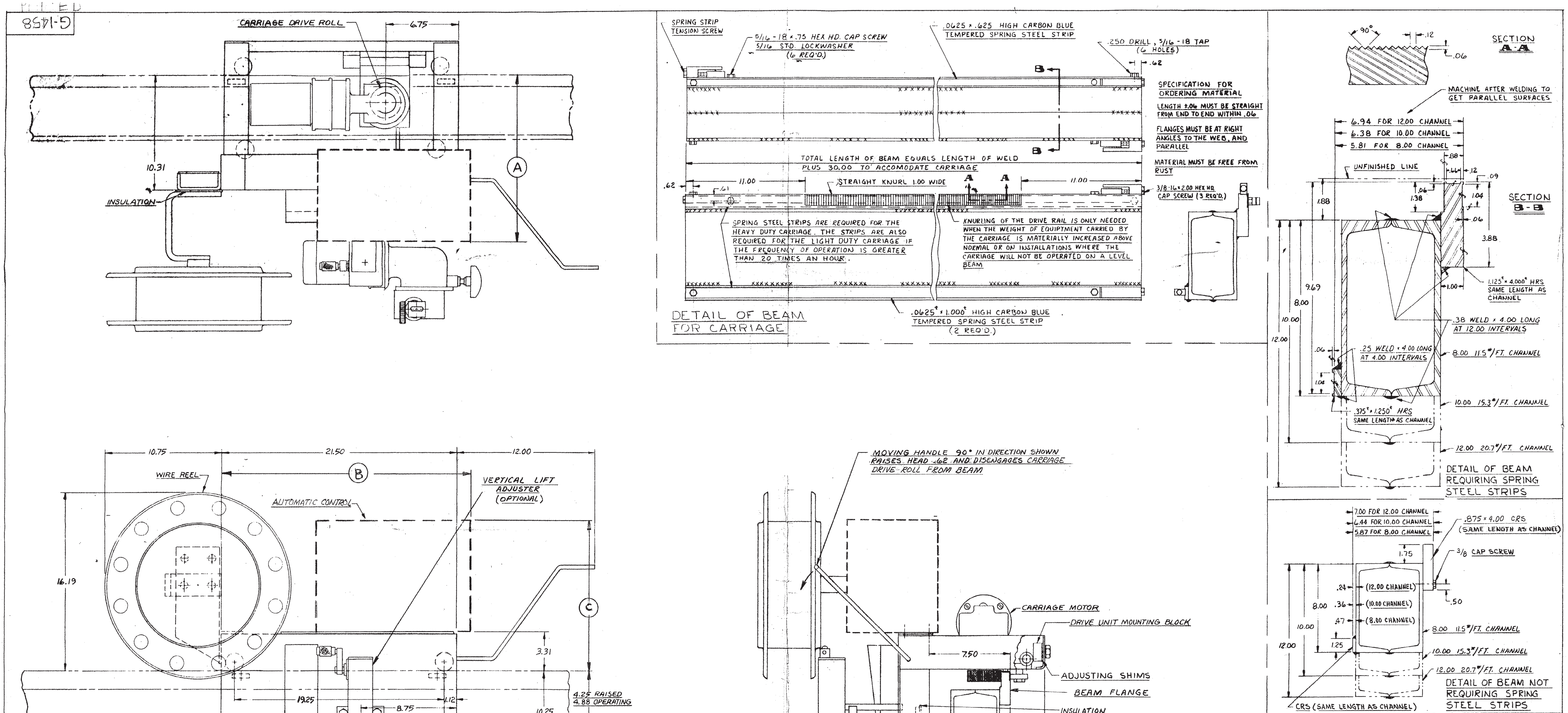


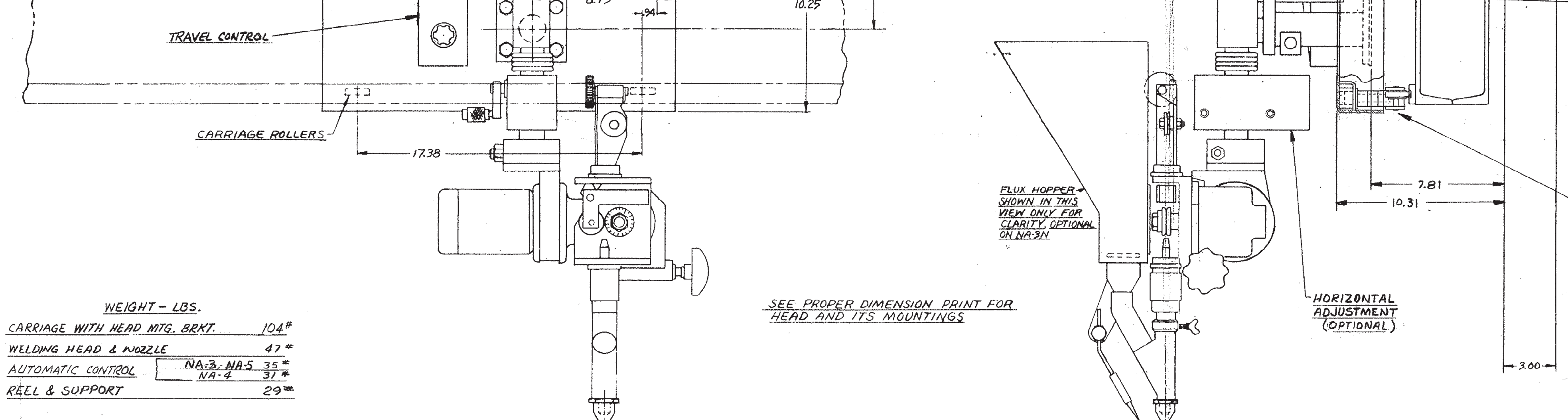
 P-135-G.1

Indicates a Change This Printing

ITEM	DESCRIPTION	PART NO.	QTY.	1	2	3	4	5	6	7	8	9	
1	Control Box	M14288	1										
2	Control Box Cover	S17147	1										
3	Printed Circuit Board Insulation	S17139	1										
4	Multi-Procedure P.C. Board	G1567-2	1										#
5	Remote Selection P.C. Board	M14220-1	1										#
6	Warning Decal	T13470	1										
7	Box Connector	T9639-2	1										
8	Plug Button	T10397-14	1										
9	Harness	S14165-287	1										
10	Nameplate	M14264	1										
11	Square Insulating Tube	T14767	6										
12	Shaft Seal	T14034	6										
13	Rheostat Knob	T10491	6										
14	Rotary Switch Knob	T13639	1										
15	Security Panel	S17149	1										
16	Lock Tab	T10045-40	1										
17	Self Tapping Screw	S8025-70	5										
18	Self Tapping Screw - Not Illustrated - Mounts Box	S8025-70	2										
19	Grommet	T9274-3	2										

NOTES





CARRIAGE LEVELING & ADJUSTMENT INSTRUCTIONS

CARRIAGE AS SHIPPED IS ASSEMBLED SUCH THAT IT WILL FIT PROPERLY ON AN 8.00 BEAM HAVING A .88 WIDE FLANGE WITH NO KNURL

BEAMS WITH KNURLED OR NON-STANDARD FLANGES:

TO OBTAIN THE BEST BEAM AND DRIVE ROLL LIFE ON BEAMS WHICH HAVE .88 WIDE KNURLED FLANGES, REMOVE THE .06 SHIM FROM BEHIND EACH DRIVE UNIT MOUNTING BLOCK.
TO OBTAIN THE BEST BEAM AND DRIVE ROLL LIFE ON BEAMS WHOSE FLANGES ARE SOME OTHER DIMENSION ADD OR REMOVE SHIMS BEHIND THE DRIVE UNIT MOUNTING BLOCKS UNTIL THE FACE OF THE KNURLED DRIVE ROLL IS FULLY SEATED ON THE BEAM FLANGE.

	STANDARD CARRIAGE FRONT BEARING MOUNTINGS	HIGH CAPACITY CARRIAGE FRONT BEARING MOUNTINGS
8.00 BEAM	1/2 - 13 × 2.50 SOCKET HD SCREW; .56 .56 .36 SPACERS; BEARING BAR	1/2 - 13 × 2.50 SOCKET HD. SCREW; .56 .56 SPACERS; BEARING BAR
10.00 BEAM	1/2 - 13 × 2.00 SOCKET HD. SCREW; .56 .36 SPACERS; BEARING BAR	1/2 - 13 × 2.00 SOCKET HD. SCREW; .56 SPACER; BEARING BAR
12.00 BEAM	1/2 - 13 × 1.50 SOCKET HD. SCREW; .36 SPACER; BEARING BAR	1/2 - 13 × 1.50 SOCKET HD. SCREW; BEARING BAR

FOR USE WITH NON-STANDARD TRAVEL BEAMS:
USE SPACERS AND STANDARD FLATWASHERS TO SHIM UNTIL THE CARRIAGE IS SQUARE WITH THE BEAM AND ALL BEARINGS MAKE FULL FACE CONTACT WITH BEAM. CHECK THIS BY RUNNING THE BEARING OVER A PIECE OF PAPER.

WEIGHT – LBS.

CARRIAGE WITH HEAD MTG. BRKT.		104#
WELDING HEAD & NOZZLE		47#
AUTOMATIC CONTROL	NA-3, NA-5	35#
	NA-4	31#
REEL & SUPPORT		29#
FLUX HOPPER		16#
FLUX HOPPER CAPACITY		20#
VERTICAL LIFT ADJUSTER		18#
HORIZONTAL ADJUSTMENT		13#

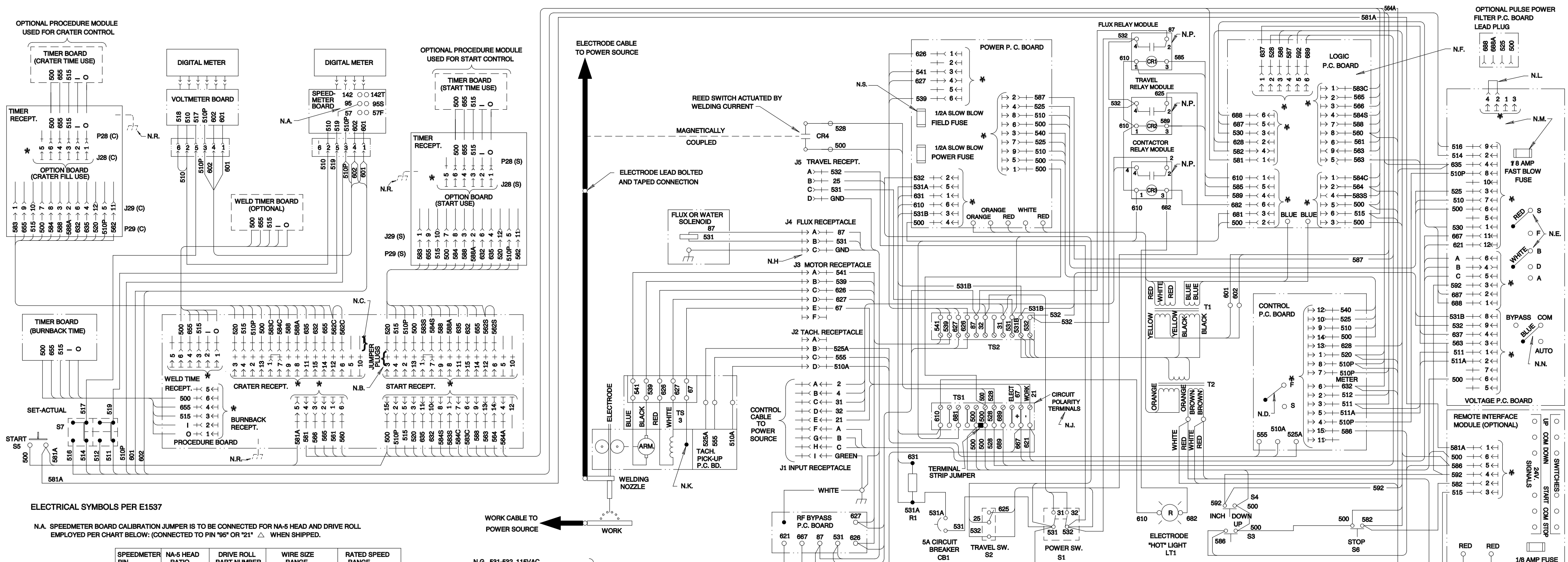
NA-5	16.25	24.00	18.55
NA-4	16.15	21.50	14.00
NA-3	16.15	21.50	14.00
CONTROLS	A	B	C

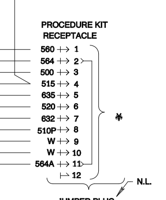
UNLESS OTHERWISE SPECIFIED, TOLERANCE ON HOLE SIZES PER E-2056
ON 2 PLACE DECIMALS IS ±.02
ON 3 PLACE DECIMALS IS ±.002
ON ALL ANGLES IS ±.5 OF A DEGREE
MATERIAL TOLERANCE "E" TO AGREE WITH PUBLISHED STANDARDS.

THE LINCOLN ELECTRIC CO.
CLEVELAND, OHIO U.S.A.
DATE 2-25-77 SCALE 1/4 & 1/2

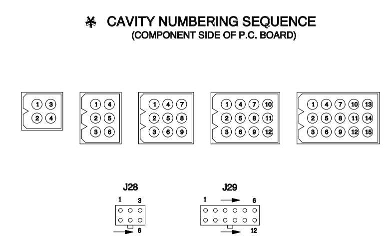
Chge. Sht. No.: 9-15-78; 5-15-81B; 12-17-81P

TYPE NA-3, NA-4, NA-5 WELDING HEAD & CARRIAGE
SUBJECT DIMENSION PRINT
SUP'S'D DRG. G-1393 CHK. SHEET NO. G-1458





✱ CAVITY NUMBERING SEQUENCE
(COMPONENT SIDE OF P.C. BOARD)



ELECTRICAL SYMBOLS PER E1537

N.A. SPEEDMETER BOARD CALIBRATION JUMPER IS TO BE CONNECTED FOR NA-5 HEAD AND DRIVE ROLL EMPLOYED PER CHART BELOW: (CONNECTED TO PIN "95" OR "21" △ WHEN SHIPPED.

SPEEDMETER PIN	NA-5 HEAD RATIO	DRIVE ROLL PART NUMBER	WIRE SIZE RANGE	RATED SPEED RANGE
57F	57/1	S12778	SINGLE .035-.052	40-778 I.P.M.
57	57/1	S12515	SINGLE 1/16-3/32	38-762 I.P.M.
95	95/1	S12514	SINGLE 3/32-5/32	22-428 I.P.M.
95S ⊗	95/1	S12515	SINGLE 1/16-3/32	23-456 I.P.M.
		S13161-052	TWIN .045-.052	
		S13161-5/64	TWIN 1/16-5/64	
		S14904(OUTER) S14905(INNER)	TWIN 3 32	
142	142/1	S12514	SINGLE 3/32-7/32	15-289 I.P.M.
142T ⊗	142/1	S14904(OUTER) S14905(INNER)	TWIN 5/64-1/8	15-300 I.P.M.
21 △	21/1	S12778	SINGLE .035-.052	100-2070 I.P.M.

⊗ = EARLIER SPEEDMETER BOARDS DID NOT HAVE THESE PINS.
△ = SINGLE "21" PIN ON HIGH SPEED BOARD ONLY.

N.B. REMOVE START RECEPTACLE JUMPER PLUG FROM PROCEDURE BOARD TO INSTALL OPTIONAL PROCEDURE MODULE AS START PROCEDURE CONTROL. IF MODULE IS REMOVED, REPLACE JUMPER PLUG.

N.C. REMOVE CRATER RECEPTACLE JUMPER PLUG FROM PROCEDURE BOARD TO INSTALL OPTIONAL PROCEDURE MODULE AS CRATER PROCEDURE CONTROL AND CONNECT LOGIC BOARD LEAD #694 TO PIN #P10. IF MODULE IS REMOVED, REPLACE JUMPER PLUG AND LOGIC BOARD LEAD #694 TO PIN #P8.

N.D. CONTROL BOARD JUMPER LEAD CONNECTED TO PIN "F" WHEN SHIPPED. SEE OPERATING MANUAL FOR USE OF PIN "S" JUMPER CONNECTION.

N.E. VOLTAGE BOARD RED JUMPER LEAD CONNECTED TO PIN "S" AND WHITE JUMPER LEAD CONNECTED TO PIN "B" WHEN SHIPPED, FOR USE TYPICALLY WITH DC-[ ]TYPE POWER SOURCES. REFER TO CONNECTION DIAGRAM FOR ALTERNATE CONNECTIONS, AND JUMPER CONNECTIONS FOR R3S, SAM AND SAF OR SA POWER SOURCES WITH K224. EARLIER VOLTAGE BOARDS DO NOT CONTAIN PIN "D".

N.F. LOGIC BOARD DIP SWITCHES OR JUMPERS TO BE SET TO SUIT DESIRED APPLICATIONS PER CHARTS BELOW:

▲ NA-5 SHIPPED CONNECTED FOR INDICATED METHODS OF TRAVEL & BURNBACK.

N.G. 531-532 115VAC
531-25 115VAC (SWITCHED) } 250 VA

N.H. 531-87 115 VAC (SWITCHED) 1/2 AMP.

N.J. CONNECT #67 BLACK (ELECTRODE) LEAD AND #21 WHITE (WORK) LEAD TO APPROPRIATE TERMINAL STRIP POLARITY CONNECTIONS WHICH MATCH ELECTRODE AND WORK CABLE POLARITY CONNECTIONS TO POWER SOURCE.

N.K. LEAD CONNECTED TO MOTOR FRAME WHICH IS ELECTRICALLY COMMON WITH ELECTRODE DRIVE ROLL AND DRIVEN ELECTRODE. NOTE: NA-5 MOTORS INSULATED FOR HIGH FREQUENCY STARTING DO NOT HAVE THIS CONNECTION. REFER TO HI-FREQUENCY INSTALLATION INSTRUCTIONS FOR REQUIRED #67 ELECTRODE VOLTAGE SENSING LEAD CONNECTION.

N.L. REMOVE JUMPER PLUG TO INSTALL OPTIONAL KIT. IF KIT IS REMOVED, REPLACE JUMPER PLUG.

N.M. NOT PRESENT ON EARLIER VOLTAGE P.C. BOARDS.

N.N. BLUE JUMPER LEAD NOT PRESENT ON EARLIER VOLTAGE P.C. BOARDS. THE JUMPER IS TO BE CONNECTED TO THE "COM" TAB, UNLESS SPECIFIED ON THE POWER SOURCE CONNECTION DIAGRAM TO BE CONNECTED TO THE "AUTO" TAB TO DISABLE THE "COLD" STARTING FEATURE.

N.P. EARLIER RELAYS HAD SAME TERMINAL NUMBERS BUT IN A DIFFERENT ORIENTATION.

N.R. POTENTIOMETERS AND SWITCHES MOUNTED ON P.C. BOARD ARE CONNECTED TO FRAME, FOR ESD. (NOT PRESENT ON EARLIER BOARDS)

N.S. THE FIELD FUSE WAS REPLACED WITH A PTC RESETTABLE FUSE ON LATER MODEL POWER BOARDS.

SAMPLE SWITCH
SWITCH POSITION 1 IS UP
SWITCH POSITION 2 IS DOWN
SWITCH POSITIONS 3 AND 4 ARE NOT APPLICABLE

METHODS OF TRAVEL

	FOR EARLIER LOGIC P.C. BOARDS WITH JUMPERS	FOR LOGIC P.C. BOARDS WITH DIP SWITCHES	
START/STOP WITH SWITCHES ▲	CONNECT LEAD #691 to P6 LEAD #692 to P5	SWITCH #1	SWITCH #2
START/STOP WITH WELD CURRENT	CONNECT LEAD #691 to P6 LEAD #692 to P7	SWITCH #1	SWITCH #2
START WITH WELD CURRENT STOP WITH STOP SWITCH	CONNECT LEAD #691 to P5 LEAD #692 to P7	SWITCH #1	SWITCH #2
START WITH START SWITCH STOP AFTER CRATER TIME (OPTIONAL PROCEDURE MODULE INSTALLED IN CRATER RECEPTACLE)	CONNECT LEAD #691 to P6 LEAD #692 to P9	SWITCH #1	SWITCH #2
START WITH START SWITCH STOP AFTER BURN-BACK TIME (OPTIONAL PROCEDURE MODULE INSTALLED IN CRATER RECEPTACLE)	CONNECT LEAD #691 to P6 LEAD #692 to P8	SWITCH #1	SWITCH #2

METHODS OF BURNBACK

	FOR EARLIER LOGIC P.C. BOARDS WITH JUMPERS	FOR LOGIC P.C. BOARDS WITH DIP SWITCHES	
WIRE FEED STOP WITH CONTACTOR DELAY ▲	CONNECT LEAD #690 TO P4 LEAD #693 TO P3	SWITCH #1	SWITCH #2
INCH UP WITH CONTACTOR DELAY	CONNECT LEAD #690 TO P4 LEAD #693 TO P1	SWITCH #1	SWITCH #2
INCH UP WITH NO CONTACTOR DELAY	CONNECT LEAD #690 TO P2 LEAD #693 TO P1	SWITCH #1	SWITCH #2

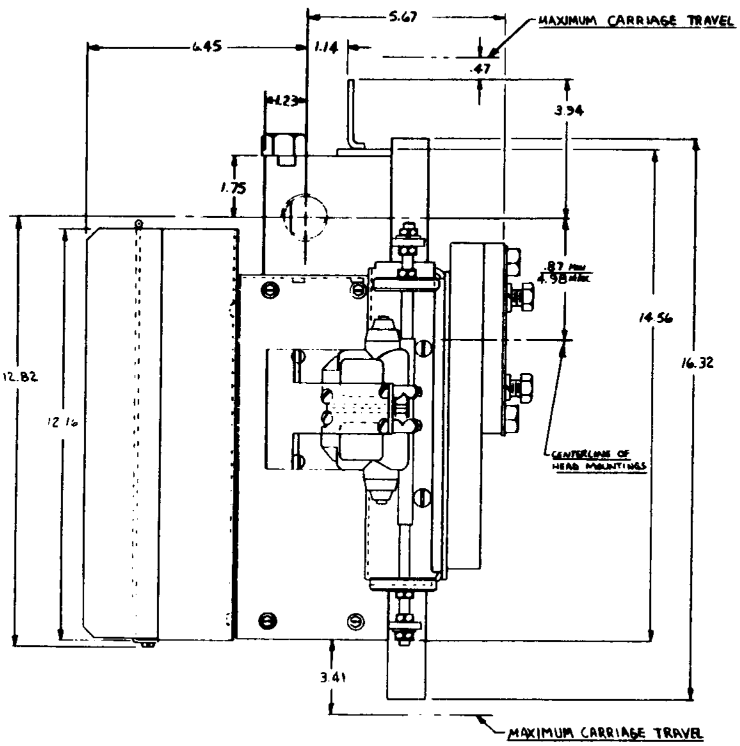
USE OF OPTIONAL CRATER MODULE

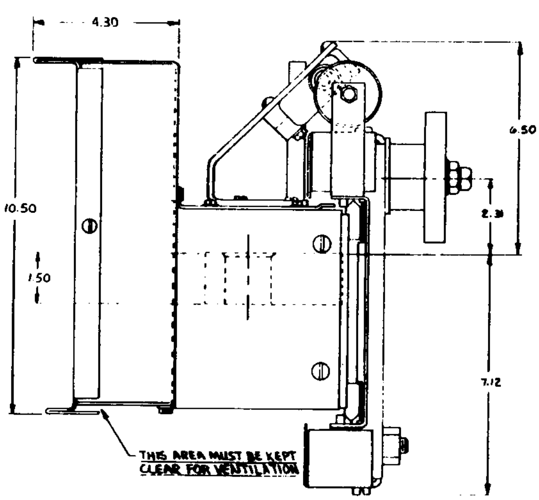
CRATER BOARD INSTALLED?	FOR EARLIER LOGIC P.C. BOARDS WITH JUMPERS	FOR LOGIC P.C. BOARDS WITH DIP SWITCHES	
YES	CONNECT LEAD #694 TO P10	SWITCH #1	SWITCH #2
NO ▲	CONNECT LEAD #694 TO P8	SWITCH #1	SWITCH #2

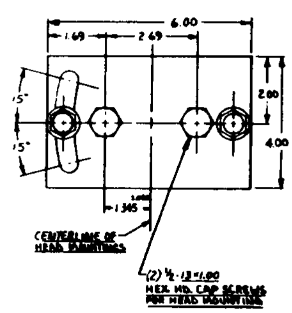
A

G1553

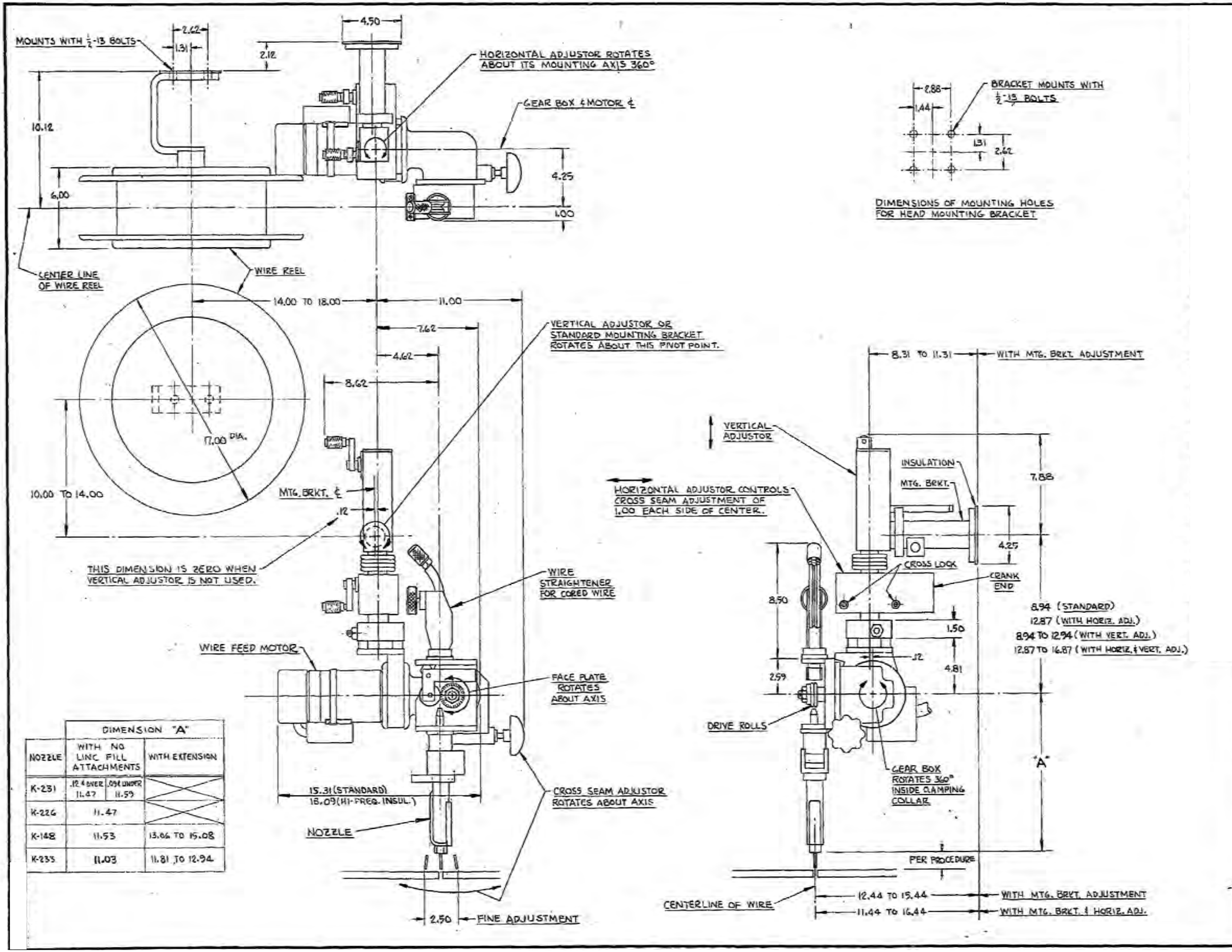
K278 SPREADARC DIMENSIONS







DIMENSION PRINT

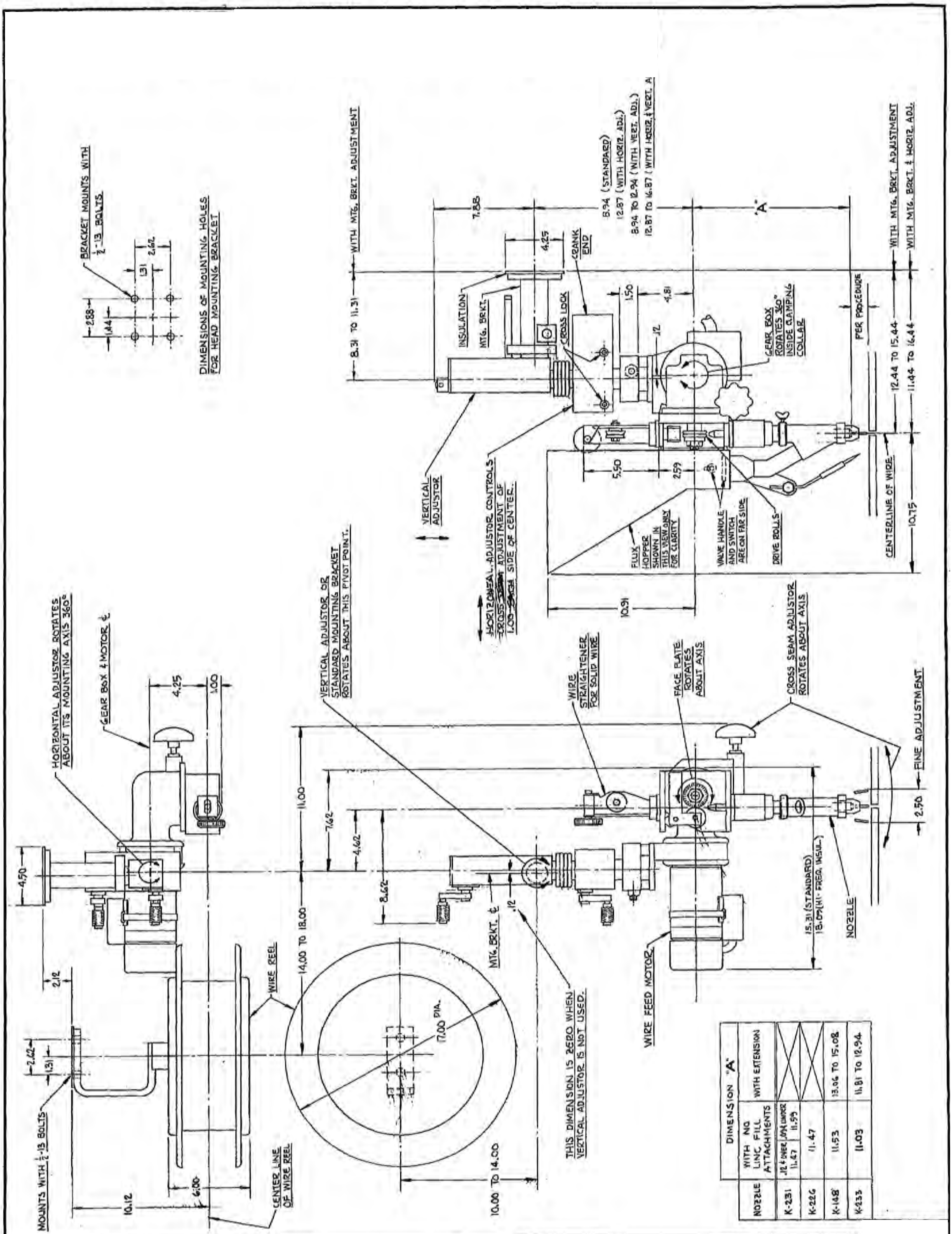


NOZZLE	DIMENSION "A" WITH NO LINC FILL ATTACHMENTS		DIMENSION "A" WITH EXTENSION
K-231	.12 & OVER 11.47	.09 & UNDER 11.59	X
K-226	11.47		X
K-148	11.53		13.06 TO 15.08
K-235	11.03		11.81 TO 12.94

L6227

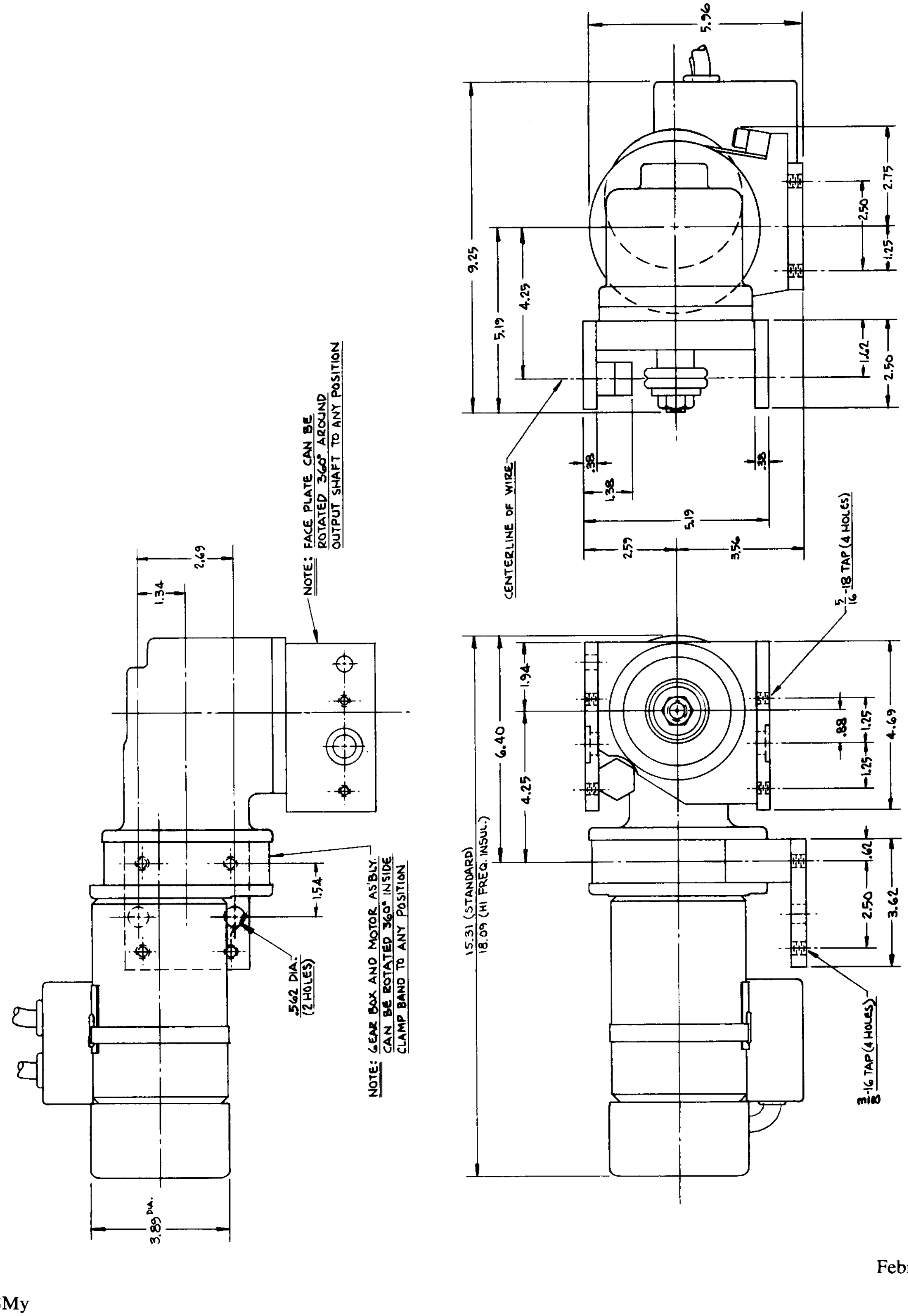
DIMENSION PRINT

L6228



NOZZLE	DIMENSION "A" WITH NO LINC FILL ATTACHMENTS	DIMENSION "A" WITH EXTENSION
K-231	.12 & OVER 11.47 / [illegible] & UNDER 11.59	X
K-226	11.47	X
K-148	11.53	13.06 TO 15.08
K-233	11.03	11.81 TO 12.94

NA-5 MOTOR, GEAR BOX AND FACE PLATE ASSEMBLY



CONNECTION OF HI-FREQ (K238) TO NA-5

(NA-5 Head AND Controls Must Be Above Code 8300)

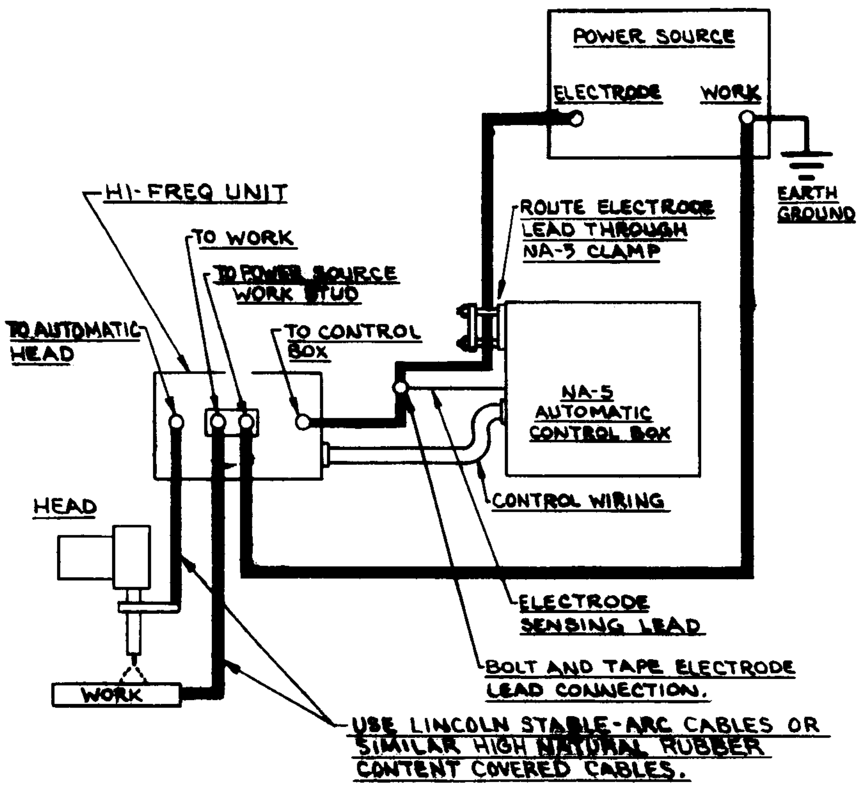
PRECAUTION: BEFORE CONNECTING THE HIGH FREQUENCY UNIT.

A. REFER TO THE HIGH FREQUENCY INSTRUCTIONS INCLUDED IN THE HI-FREQ UNIT LITERATURE PACKAGE, WHICH IS ALSO IN THE MANUAL FOR THE AUTOMATIC WELDING EQUIPMENT BEING USE.

B. BE SURE THE AUTOMATIC WELDING EQUIPMENT BEING USED HAS THE FOLLOWING PROTECTION.

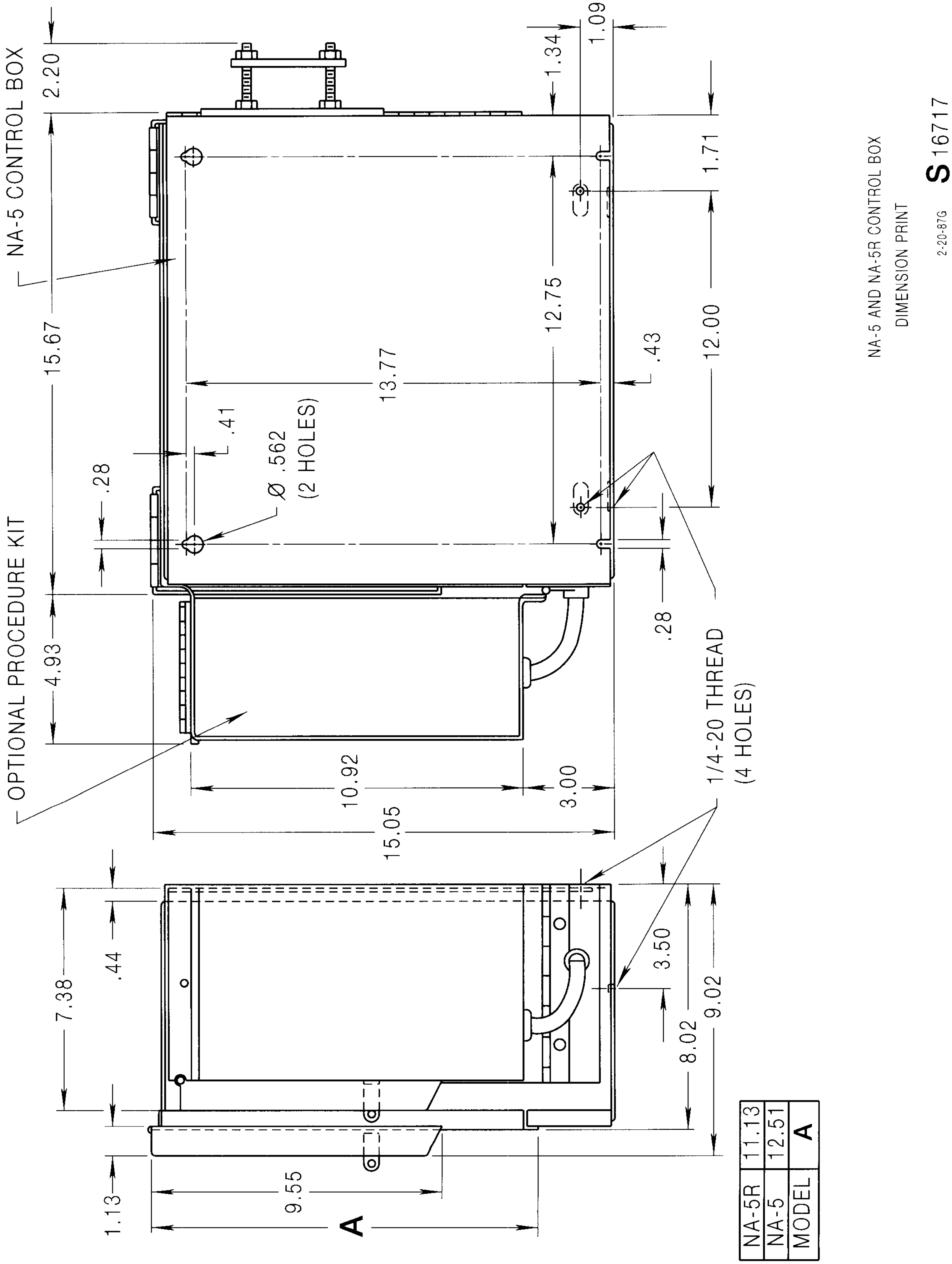
1. FACTORY INSTALLED HI-FREQ INSULATION BETWEEN HEAD MOTOR AND GEARBOX.
2. FACTORY PROVIDED HI-FREQ INSULATION FOR HEAD MOUNTED FLUX HOPPER.
3. FACTORY PROVIDED HI-FREQ INSULATION FOR WIRE REEL MOUNTING.
4. HI-FREQ INSULATION FOR HEAD MOUNTING. MODELS WITHOUT FACTORY PROVIDED INSULATION MUST BE INSULATED WITH A MINIMUM OF ONE INCH THICK POLYESTER LAMINATE PROVIDING THE HEAD WITH NO LESS THAN ONE INCH EXPOSED AND 1/2 INCH UNEXPOSED ELECTRICAL CLEARANCE BETWEEN HEAD MOUNTING BRACKET AND MOUNTING SURFACE (INCLUDING ELECTRICALLY COMMON MOUNTING HARDWARE).

C. WELDING CABLES MUST BE OF PROPER CAPACITY FOR CURRENT AND DUTY CYCLE OF IMMEDIATE AND FUTURE APPLICATIONS.

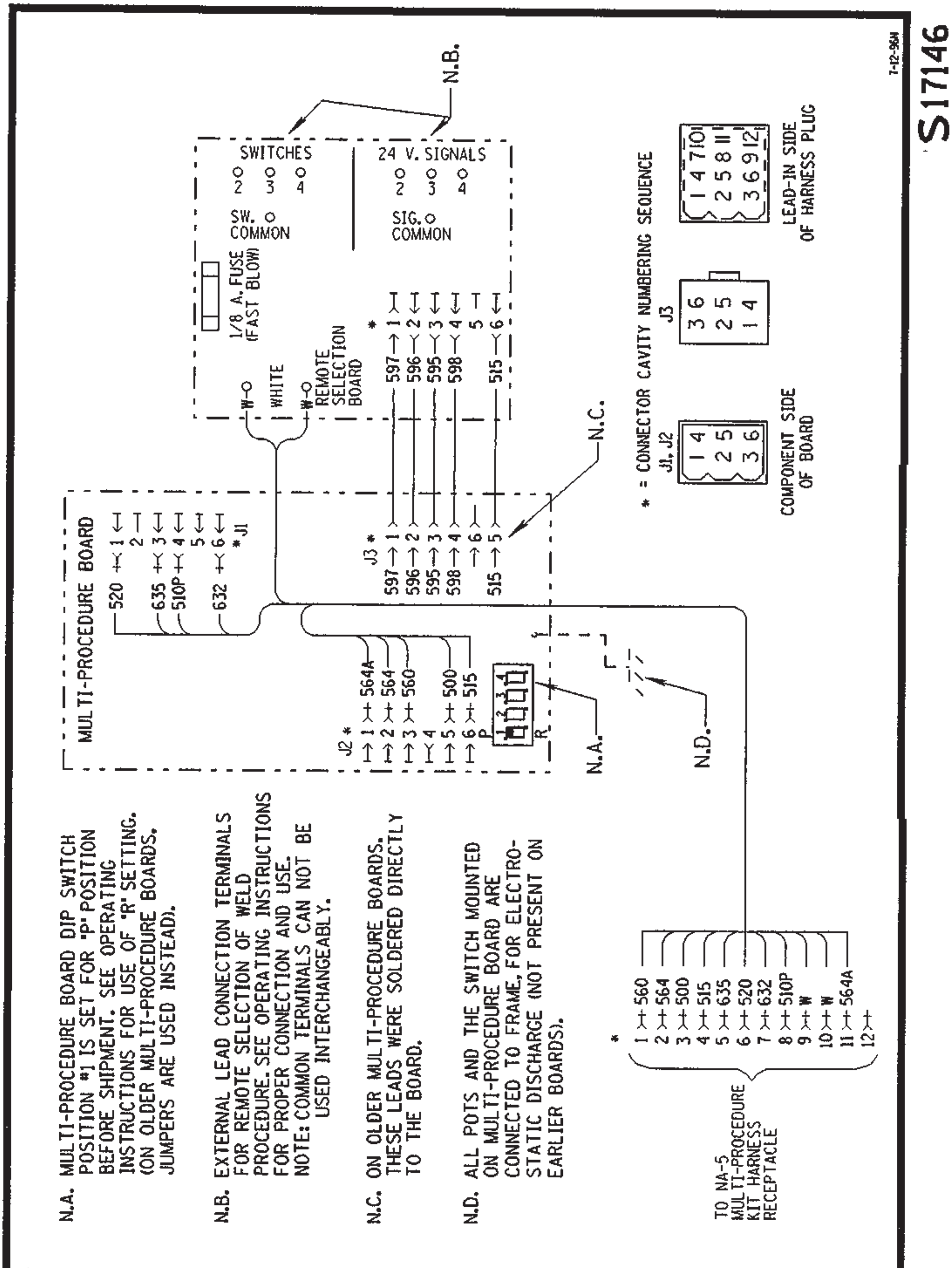


CONTROL WIRING INSTRUCTIONS

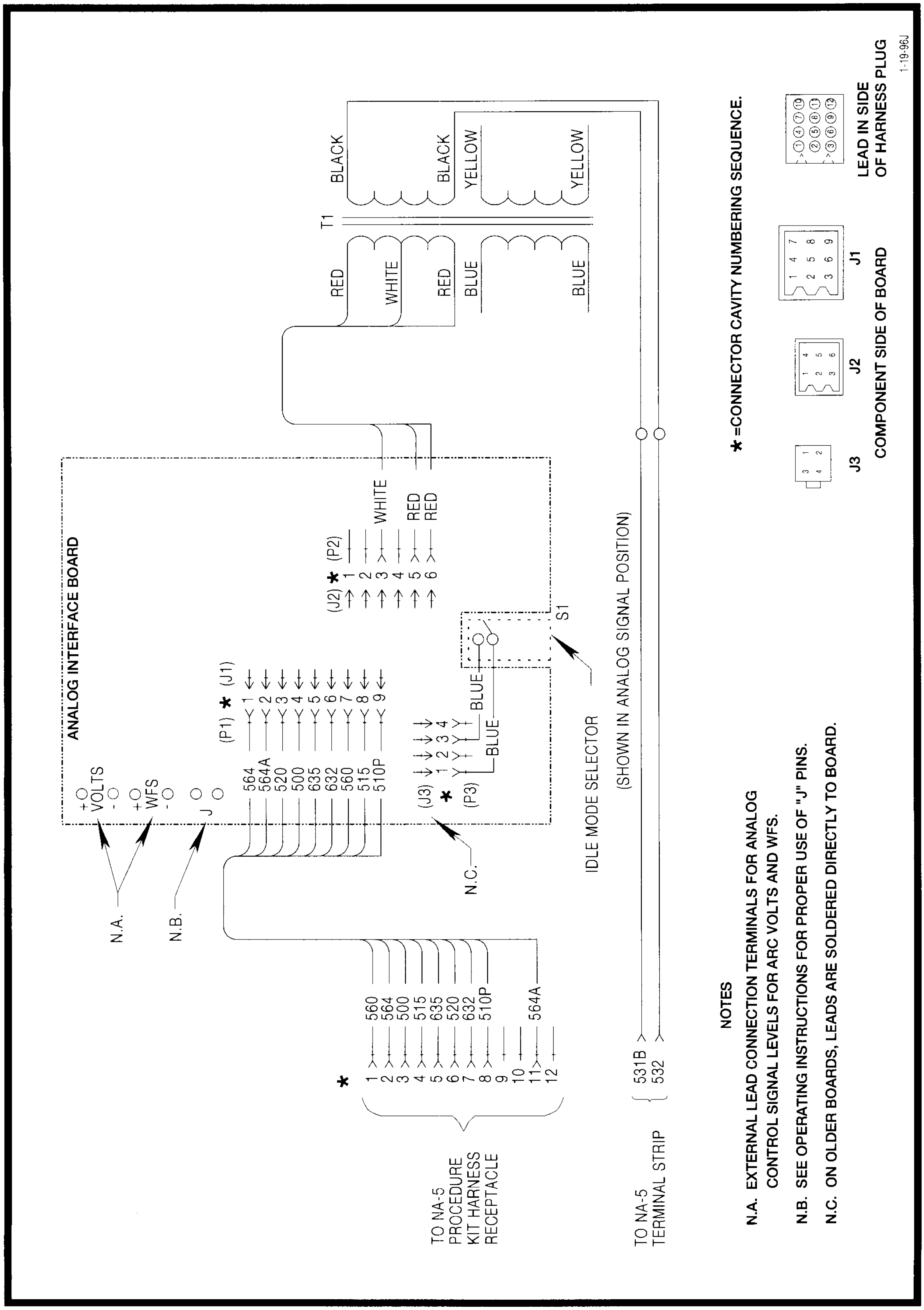
1. REMOVE PLASTIC BUTTON PLUG FROM SIDE OF AUTOMATIC EQUIPMENT, INSTALL A BOX CONNECTOR OR PROVIDE OTHER APPROPRIATE STRAIN RELIEF FOR CONTROL LEADS. USE AT LEAST #18 AWG 300V. STRANDED COPPER LEADS.
2. CONNECT A LEAD FROM HI-FREQ TERMINAL STRIP #31 TO AUTOMATIC TERMINAL STRIP #31.
3. CONNECT A LEAD FROM HI-FREQ TERMINAL STRIP #87 TO AUTOMATIC TERMINAL STRIP #87.
4. CONNECT A LEAD FROM HI-FREQ TERMINAL STRIP #681 TO AUTOMATIC TERMINAL STRIP #681.
5. CONNECT A LEAD FROM HI-FREQ TERMINAL STRIP #510 TO AUTOMATIC TERMINAL STRIP #610.
6. CONNECT A LEAD FROM HI-FREQ GROUNDING STUD TO AUTOMATIC GROUNDING STUD.
7. ALL OF THE ABOVE LEADS MUST BE TWISTED TOGETHER AND ELECTRICALLY SHIELDED. THE SHIELDING MUST BE GROUNDED TO THE AUTOMATIC CONTROL BOX AND KEPT AT LEAST SIX INCHES AWAY FROM ANY LEADS CARRYING HIGH FREQUENCY.
8. REMOVE THE #67 BLACK LEAD FROM THE NA-5 TERMINAL STRIP POLARITY CONNECTION AND TAPE THE TERMINAL OF THE REMOVED LEAD.
9. CONNECT AN ELECTRODE SENSING LEAD FROM THE BOLTED ELECTRODE LEAD CONNECTION TO THE APPROPRIATE NA-5 TERMINAL STRIP POLARITY CONNECTION (REFER TO NA-5 WIRING DIAGRAM).


NA-5 CONTROL BOX
OPTIONAL PROCEDURE KIT
2.20
15.67
4.93
.28
.41
Ø .562
(2 HOLES)
13.77
12.75
1.34
1.09
1.71
12.00
.43
.28
1/4-20 THREAD
(4 HOLES)
10.92
3.00
15.05
7.38
.44
1.13
9.55
A
3.50
8.02
9.02
NA-5R 11.13
NA-5 12.51
MODEL A
NA-5 AND NA-5R CONTROL BOX
DIMENSION PRINT
2-20-87G
S 16717

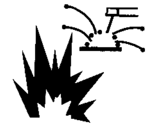
K349 MULTI-PROCEDURE KIT



Sec.T2.5.20 (Continued)



NOTES

			
WARNING	● Do not touch electrically live parts or electrode with skin or wet clothing. ● Insulate yourself from work and ground.	● Keep flammable materials away.	● Wear eye, ear and body protection.
Spanish **AVISO DE PRECAUCION**	● No toque las partes o los electrodos bajo carga con la piel o ropa mojada. ● Aislese del trabajo y de la tierra.	● Mantenga el material combustible fuera del área de trabajo.	● Protéjase los ojos, los oídos y el cuerpo.
French **ATTENTION**	● Ne laissez ni la peau ni des vêtements mouillés entrer en contact avec des pièces sous tension. ● Isolez-vous du travail et de la terre.	● Gardez à l'écart de tout matériel inflammable.	● Protégez vos yeux, vos oreilles et votre corps.
German **WARNUNG**	● Berühren Sie keine stromführenden Teile oder Elektroden mit Ihrem Körper oder feuchter Kleidung! ● Isolieren Sie sich von den Elektroden und dem Erdboden!	● Entfernen Sie brennbarres Material!	● Tragen Sie Augen-, Ohren- und Körperschutz!
Portuguese **ATENÇÃO**	● Não toque partes elétricas e electrodos com a pele ou roupa molhada. ● Isole-se da peça e terra.	● Mantenha inflamáveis bem guardados.	● Use proteção para a vista, ouvido e corpo.
Japanese **注意事項**	● 通電中の電気部品、又は溶材にヒフやぬれた布で触れないこと。 ● 施工物やアースから身体が絶縁されている様にして下さい。	● 燃えやすいものの側での溶接作業は絶対にしてはなりません。	● 目、耳及び身体に保護具をして下さい。
Chinese **警 告**	● 皮肤或濕衣物切勿接觸帶電部件及銲條。 ● 使你自己與地面和工件絶緣。	● 把一切易燃物品移離工作場所。	● 佩戴眼、耳及身體勞動保護用具。
Korean **위 험**	● 전도체나 용접봉을 젖은 헝겁 또는 피부로 절대 접촉치 마십시요. ● 모재와 접지를 접촉치 마십시요.	● 인화성 물질을 접근 시키지 마시요.	● 눈, 귀와 몸에 보호장구를 착용하십시요.
Arabic **تحذير**	● لا تلمس الاجزاء التي يسري فيها التيار الكهربائي أو الالكترود بجلد الجسم أو بالملابس المبللة بالماء. ● ضع عازلا على جسمك خلال العمل.	● ضع المواد القابلة للاشتعال في مكان بعيد.	● ضع أدوات وملابس واقية على عينيك وأذنيك وجسمك.

READ AND UNDERSTAND THE MANUFACTURER'S INSTRUCTION FOR THIS EQUIPMENT AND THE CONSUMABLES TO BE USED AND FOLLOW YOUR EMPLOYER'S SAFETY PRACTICES.

SE RECOMIENDA LEER Y ENTENDER LAS INSTRUCCIONES DEL FABRICANTE PARA EL USO DE ESTE EQUIPO Y LOS CONSUMIBLES QUE VA A UTILIZAR, SIGA LAS MEDIDAS DE SEGURIDAD DE SU SUPERVISOR.

LISEZ ET COMPRENEZ LES INSTRUCTIONS DU FABRICANT EN CE QUI REGARDE CET EQUIPMENT ET LES PRODUITS A ETRE EMPLOYES ET SUIVEZ LES PROCEDURES DE SECURITE DE VOTRE EMPLOYEUR.

LESEN SIE UND BEFOLGEN SIE DIE BETRIEBSANLEITUNG DER ANLAGE UND DEN ELEKTRODENEINSATZ DES HERSTELLERS. DIE UNFALLVERHÜTUNGSVORSCHRIFTEN DES ARBEITGEBERS SIND EBENFALLS ZU BEACHTEN.

			
● Keep your head out of fumes. ● Use ventilation or exhaust to remove fumes from breathing zone.	● Turn power off before servicing.	● Do not operate with panel open or guards off.	**WARNING**
● Los humos fuera de la zona de respiración. ● Mantenga la cabeza fuera de los humos. Utilice ventilación o aspiración para gases.	● Desconectar el cable de alimentación de poder de la máquina antes de iniciar cualquier servicio.	● No operar con panel abierto o guardas quitadas.	Spanish **AVISO DE PRECAUCION**
● Gardez la tête à l'écart des fumées. ● Utilisez un ventilateur ou un aspirateur pour ôter les fumées des zones de travail.	● Débranchez le courant avant l'entretien.	● N'opérez pas avec les panneaux ouverts ou avec les dispositifs de protection enlevés.	French **ATTENTION**
● Vermeiden Sie das Einatmen von Schweibrauch! ● Sorgen Sie für gute Be- und Entlüftung des Arbeitsplatzes!	● Strom vor Wartungsarbeiten abschalten! (Netzstrom völlig öffnen; Maschine anhalten!)	● Anlage nie ohne Schutzgehäuse oder Innenschutzverkleidung in Betrieb setzen!	German **WARNUNG**
● Mantenha seu rosto da fumaça. ● Use ventilação e exhaustão para remover fumo da zona respiratória.	● Não opere com as tampas removidas. ● Desligue a corrente antes de fazer serviço. ● Não toque as partes elétricas nuas.	● Mantenha-se afastado das partes moventes. ● Não opere com os paineis abertos ou guardas removidas.	Portuguese **ATENÇÃO**
● ヒュームから頭を離すようにして下さい。 ● 換気や排煙に十分留意して下さい。	● メンテナンス・サービスに取りかかる際には、まず電源スイッチを必ず切って下さい。	● パネルやカバーを取り外したままで機械操作をしないで下さい。	Japanese **注意事項**
● 頭部遠離煙霧。 ● 在呼吸區使用通風或排風器除煙。	● 維修前切斷電源。	● 儀表板打開或沒有安全罩時不準作業。	Chinese **警 告**
● 얼굴로부터 용접가스를 멀리하십시요. ● 호흡지역으로부터 용접가스를 제거하기 위해 가스제거기나 통풍기를 사용하십시요.	● 보수전에 전원을 차단하십시요.	● 판넬이 열린 상태로 작동치 마십시요.	Korean **위 험**
● ابعد رأسك بعيداً عن الدخان. ● استعمل التهوية أو جهاز ضغط الدخان للخارج لكي تبعد الدخان عن المنطقة التي تتنفس فيها.	● اقطع التيار الكهربائي قبل القيام بأية صيانة.	● لا تشغل هذا الجهاز اذا كانت الاغطية الحديدية الواقية ليست عليه.	Arabic **تحذير**

LEIA E COMPREENDA AS INSTRUÇÕES DO FABRICANTE PARA ESTE EQUIPAMENTO E AS PARTES DE USO, E SIGA AS PRÁTICAS DE SEGURANÇA DO EMPREGADOR.

使う機械や溶材のメーカーの指示書をよく読み、まず理解して下さい。そして貴社の安全規定に従って下さい。

請詳細閲讀並理解製造廠提供的説明以及應該使用的銀捍材料，並請遵守貴方的有関勞動保護規定。

이 제품에 동봉된 작업지침서를 숙지하시고 귀사의 작업자 안전수칙을 준수하시기 바랍니다.

اقرأ بتمعن وافهم تعليمات المصنع المنتج لهذه المعدات والمواد قبل استعمالها واتبع تعليمات الوقاية لصاحب العمل.